278

SERVICE MANUAL

AKAI TAPE RECORDER

MODEL X-1800SD

278

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	SERIAL NUMBERS	MARK
(A) TYPE	00000 ⟶ 66477	( )
(B) TYPE	66478 ⟶ 124677	(( ))
(C) TYPE	B-41203 ⟶	(( ))

I. SPECIFICATIONS

STYLE	:	Portable
WEIGHT	:	37.4 lbs (17 kg)
DIMENSIONS	:	15"H x 13-1/2"W x 9-1/2"D (378H x 338W x 238D mm)
POWER SUPPLY	:	AC 100 to 240 V, 50/60 Hz
RECORDING SYSTEM	:	Reel ..... In-line 4-track stereo, monaural recording by using Cross-field Bias Head. Cartridge .. In-line 8-track stereo recording. Transfer ... Pre-recorded conventional reel tape can be dubbed on the cartridge tape.
PLAY BACK SYSTEM	:	Reel ..... In-line 4-track stereo, monaural play back. Cartridge .. In-line 8-track stereo play back.
TAPE SPEED	:	Reel ..... 3 speeds 1-7/8", 3-3/4" and 7-1/2" (15" with 15" adaptor kit) Cartridge ..... 3-3/4"
TAPE SPEED DEVIATION	:	Within ± 3%
WOW AND FLUTTER (Play back only)	:	Reel ..... Less than 0.18% at 7-1/2" Less than 0.25% at 3-3/4" Less than 0.35% at 1-7/8" Cartridge .....Less than 0.35%
FREQUENCY RESPONSE	:	Reel . 30 to 23,000 Hz ± 3 dB at 7-1/2" 30 to 18,000 Hz ± 3 dB at 3-3/4" 30 to 9,000 Hz ± 3 dB at 1-7/8" Cartridge .....50 to 15,000 ± 3 dB
SIGNAL TO NOISE RATIO	:	Reel ....Better than 50 dB at all speeds Cartridge .....Better than 45 dB
DISTORTION (Total Harmonics)	:	Reel ..... Within 2% at 1,000 Hz 0 VU (Line output) Within 5% at 1,000 Hz 10 W (Main output) Cartridge . Within 3% at 1,000 Hz 0 VU
CROSS-TALK	:	Reel .....Less than −65 dB (Monaural) Less than −43 dB (Stereo) Cartridge .....Less than −50 dB
ERASE RATIO	:	Reel .... Less than −70 dB for all track Cartridge .....Less than −65 dB
INSULATION RESISTANCE	:	More than 50 M.Ohms
INSULATION DURABILITY	:	1,000 V. AC for more than one minute duration.
POWER OUTPUT LINE OUTPUT	:	1.228 V (0 VU) by using 250 Hz 0 VU Recorded Tape Impedance ..... 1.5 K.Ohms
MAIN OUTPUT	:	6 W maximum per each channel at Music Power, total 12 W. Impedance .....8 Ohms
INPUT LEVEL LINE INPUT	:	60 mV – 2.5 V Impedance .....150 K.Ohms
MIC INPUT	:	0.5 mV – 20 mV Impedance .....30 K.Ohms
DIN OUTPUT	:	1.228 V (0 VU) by using 250 Hz recorded tape Impedance ..... 1.5 K.Ohms
DIN INPUT	:	20 mV Impedance .....68 K.Ohms
FAST FORWARD AND REWIND TIME	:	90 seconds for 1,200 ft. tape at 50 Hz 75 seconds for 1,200 ft. tape at 60 Hz
MONITOR SYSTEM	:	Can be monitored the program being recorded by using, Built-in speaker Stereo headphone External speaker
MOTOR	:	Condenser starting induction two speed motor Horse Power ..... 1/100 HP Power Ratio ..... 70% Revolution 2,900 to 1,450 r.p.m. at 50 Hz 3,480 to 1,740 r.p.m. at 60 Hz Condenser capacity 2.5 μF at 50 Hz 2.0 μF at 60 Hz
HEADS		
a. REEL REC/PLAY HEAD	:	In-line 4-track stereo/monaural Gap ..... 2/1000 mm Impedance ... 1,200 Ohms at 1,000 Hz
BIAS HEAD	:	In-line 4-track stereo Gap .....0.2 mm Impedance .....500 Ohms at 60 K.Hz
ERASE HEAD	:	In-line 4-track stereo Gap .....0.2 mm Impedance .....500 Ohms at 60 K.Hz
b. CARTRIDGE REC/PLAY HEAD	:	In-line 8-track stereo Gap ..... 1/1000 mm Impedance 750 Ohms ± 15% at 1000 Hz
ERASE HEAD	:	In-line 8-track stereo Gap .....0.1 mm Impedance ..... 210 Ohms ± 10% at 90 K.Hz
RECORDING LEVEL INDICATOR	:	Vertical twin type VU meters
TRANSISTOR USED	:	2SC-650A x4, 2SC-281B x4, 2SC-458B x4, 2SC-968 x2, 2SC-1060 x4, 2SC-971 x2
SILICON DIODE USED	:	10D1 x3, 10D2 x4
GERMANIUM DIODE USED	:	IN-34A x 4
REELS USED	:	7", 5", 3" reels
CARTRIDGE USED	:	LEAR JET PAK 8-Track

II. MEASURING METHOD

TAPE SPEED DEVIATION

1. Method involving use of pre-recorded tape.

Playback on the tape recorder to be tested a tape pre-recorded at 1,000 cps ± 0.1% for measuring tape speed deviation. Connect the appropriate output to a frequency counter meter in order to measure the tape speed deviation from the deviation of the measured frequency.

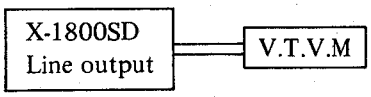
2. Method involving use of timing tape (designed for tape speed measurement).

This method utilizes a timing tape marked at intervals of 7-1/2''. The running time of the tape over 60 marked section is measured in order to calculate the deviation of the tape speed. In applying this method, however, it should be born in mind that should the timing tape stretch or contract, measurement error is inevitable, so that it is necessary to measure the total length of the tape in advance.

WOW AND FLUTTER

Playback the 3,000 cps pre-recorded tape whose wow and flutter level is guaranteed to be smaller than 0.07% for measurement by means of a wow meter. It is also possible for a 3,000 cps sine wave to be recorded and played for measurement by means of the wow meter. In this case, however, the wow meter indicates a value as much as twice the value given in the specification on the first page.

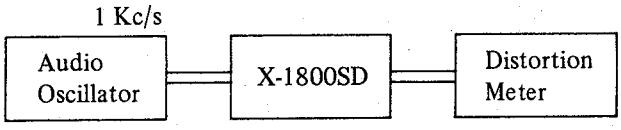
SIGNAL TO NOISE RATIO



Set the Equalizer Switch on "7-1/2" ips position and playback a tape containing a 1,000 cps sine wave recorded at "0" VU level on a standard recorder. Connect a V.T.V.M. to the line output jack of the recorder and measure its output.

Then remove the tape and measure the noise level under the same condition. Convert each of the measured values into decibels.

TOTAL HARMONIC DISTORTION FACTOR



Connect the measuring instrument as shown above, and record the 1,000 cps sine wave at "0" VU. Playback the resultant signal and measure the overall distortion factor. Measure the noise level of the tape recorder with the tape removed ; connect the audio oscillator directly to the distortion meter for measurement of the distortion factor of the oscillator.

The required distortion factor may be obtained from the results of the above measurement by the following formula.

$$d_0 = d - d_1 - d_2$$

where, d_0=Required
d =Overall distortion factor
d_1=Noise level
d_2=Distortion factor of the oscillator

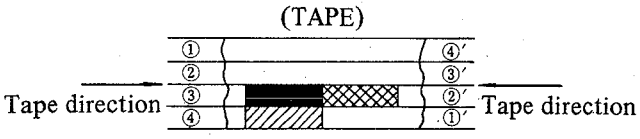
(Note : New tape of particularly good quality should be used for measurement of the distortion factor.)

POWER OUTPUT

Playback a tape containing a sine wave of 1,000 cps recorded at 0 VU on a standard recorder.

Connect a V.T.V.M. to the line output jack of the recorder and measure the voltage at the output of the recorder to be tested.

CROSS TALK (Cross talk between the tracks)

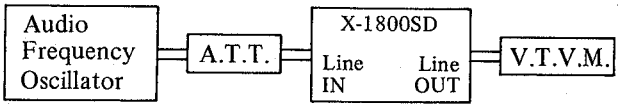


As shown in the figure, first record a 1,000 cps sine wave on track No. 3 at +3 VU level. Next, remove the 1,000 cps input signal and record under a non-input condition.
Then, playback the tape on track No. 3 and No. 1 (reversed condition of tape) through the 1,000 cps B.P.F. (Band Pass Filter, Sensitivity . . . 1:1) and obtain a ratio between the two from the following formula.

$$C=20 \log \frac{E_0}{E_2-E_1} \quad (db)$$

C =Desired crosstalk ratio (db)
E_0=1,000 Hz signal output level
E_2=1,000 Hz crosstalk output level
E_1=No-input signal record level

FREQUENCY RESPONSE



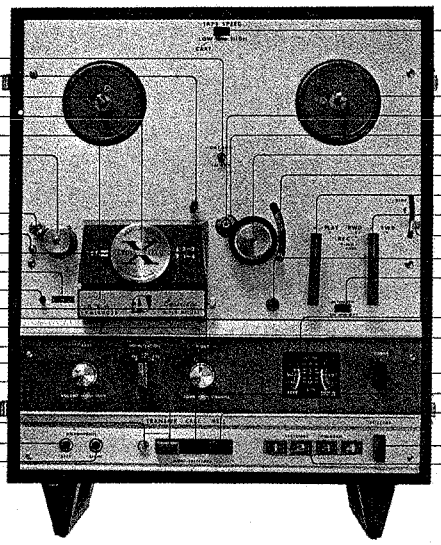
Connect the measuring instrument as in the above diagram, and measure the frequency response in the following sequence :
RECORD :

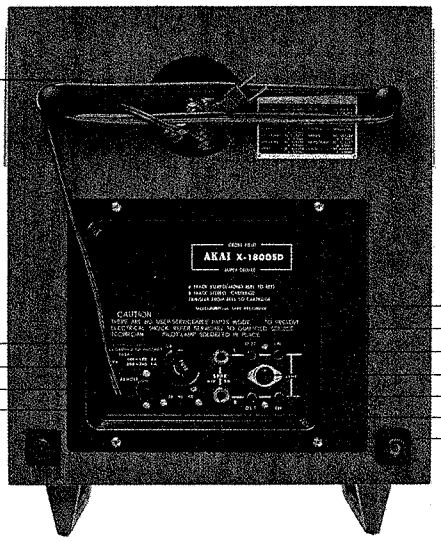
1) Give a sine wave of 1,000 cps to the Line Input of the recorder to be tested, through an attenuator from an audio frequency generator.
2) Set the Record/Playback Knob in to "Rec" position and adjust the line input volume so that the VU meter needle indicates "0" VU.
3) Under the condition described in (2), lower the input level 10 db by means of the attenuator.
4) Record the spot frequency in the range of 30 cps to 25,000 cps from the audio frequency generator.

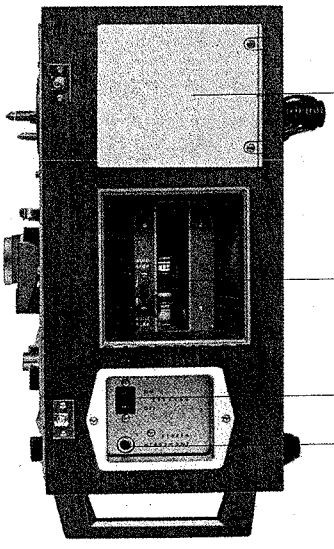
PLAYBACK :

5) Set the Record/Playback Knob in to "Play" position.
6) Set the Equalizer Switch on 7-1/2" or 3-3/4" position.
7) Connect a V.T.V.M. to the Line output.
8) Playback the tape previously recorded.
9) Adjust the output level to "0" dbm at 1,000 cps as indicated on the V.T.V.M. by the range selector of a V.T.V.M.
10) Playback the recorded spot frequencies with the conditions in (9) ; make a memo of output level and plot the value on a graph.

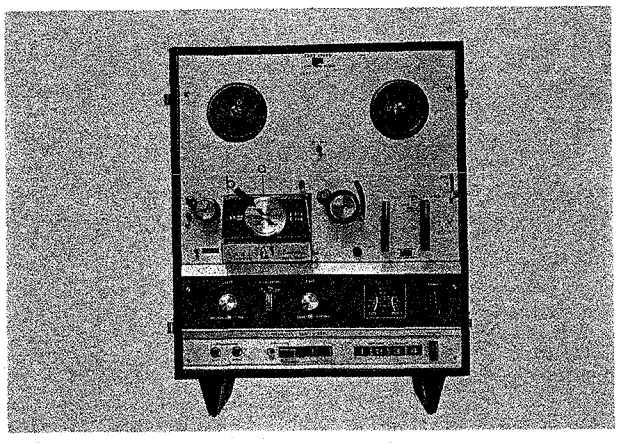
III. CONTROL LOCATIONS



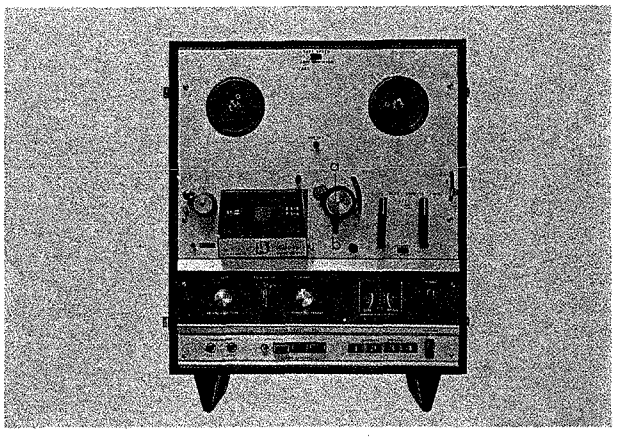




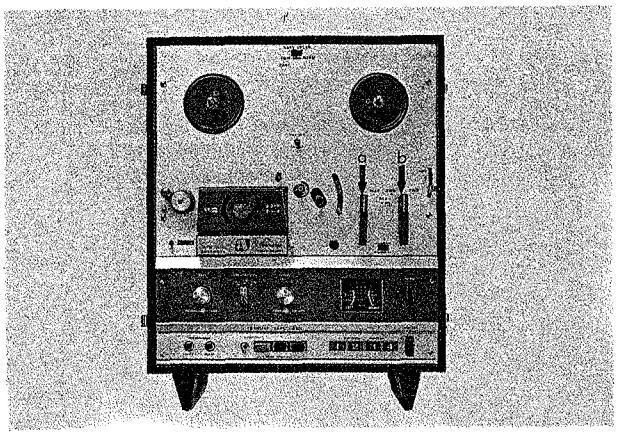
IV. DISMANTLING OF TAPE TRANSPORT UNIT & AMPLIFIERS



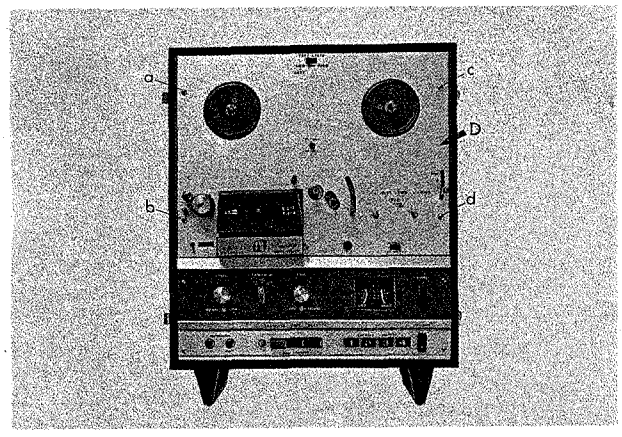
(1) Loosen the RETAINING SCREW ⓐ of the TRACK SELECTOR KNOB ⓑ using a philips-headed screw driver and remove the TRACK SELECTOR KNOB by hand.



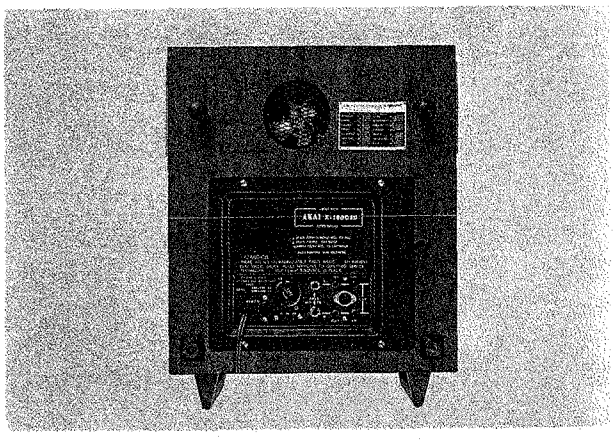
(2) Loosen the RETAINING SCREW ⓐ of PINCH WHEEL ⓑ using a philips-headed screw driver and remove the PINCH WHEEL by hand.



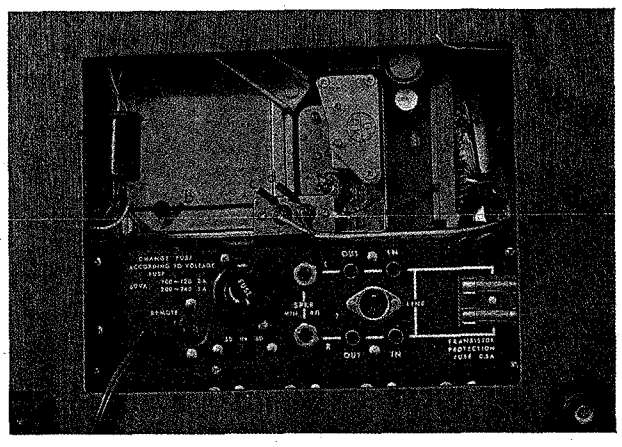
(3) Loosen the RETAINING SCREWS of the DECK CONTROL KNOBS (ⓐ and ⓑ) by using a philips-headed screw driver and remove the KNOBS by hand.



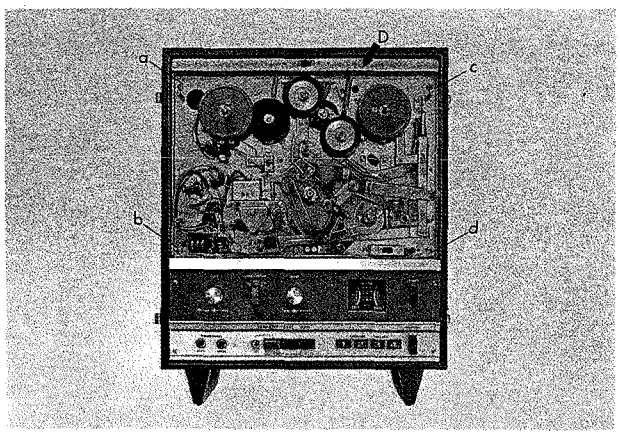
(4) Loosen the SCREWS (marked from ⓐ to ⓓ) by using a philips-headed screw driver and remove the DECK PANEL (D) by hand.



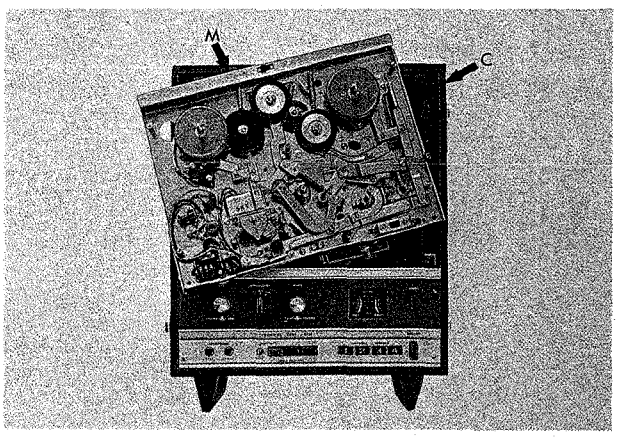
(5) Loosen the SCREWS (marked from ⓐ to ⓓ) by using a philips-headed screw driver and remove the BACK PANEL (B) by hand.



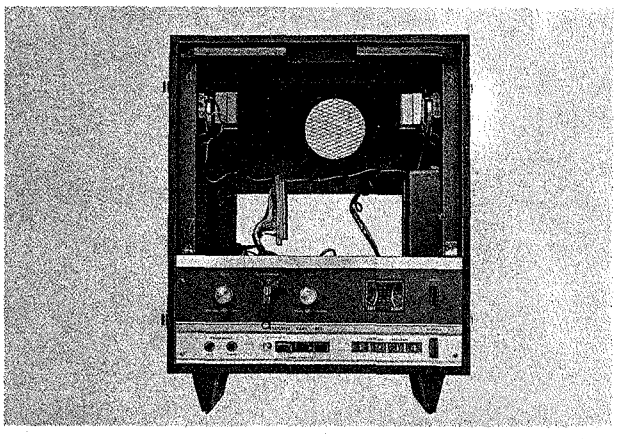
(6) Disconnect the PLUGS (marked from ⓐ to ⓔ) and ⓕ (18P Multi Jack) carefully by hand.



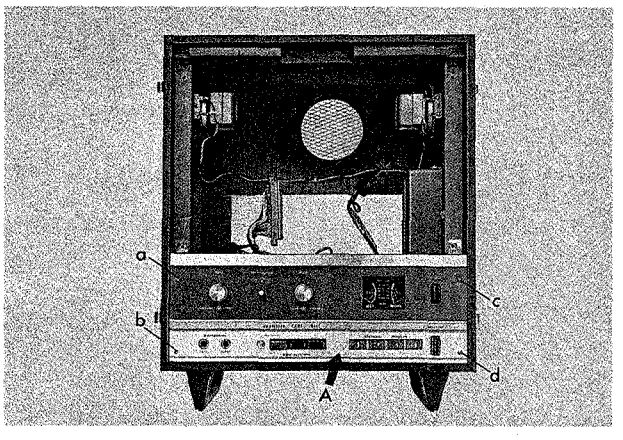
(7) Loosen the SCREWS (marked from ⓐ to ⓓ) of the DECK FRAME (D) by using a philips-headed screw driver.



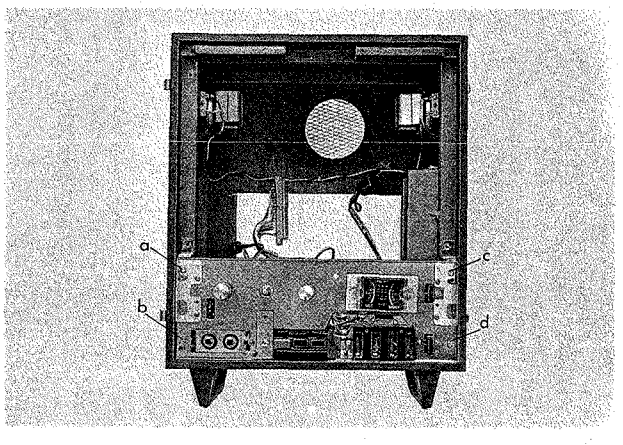
(8) Remove the TAPE TRANSPORT MECHANISM ASSEMBLY (M) by slowly lifting it from the CASE (C) as shown in picture.



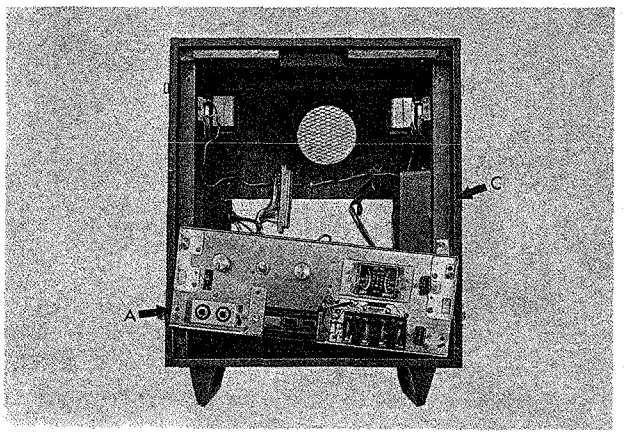
(9) Loosen the RETAINING SCREW ⓐ of EQUALIZER KNOB ⓑ using a philips-headed screw driver and remove the KNOB by hand.



(10) Loosen the SCREWS (marked from ⓐ to ⓓ) by using a philips-headed screw driver and remove the AMPLIFIER PANEL (A) by hand.



(11) Loosen the SCREWS (marked from ⓐ to ⓓ) by using a philips-headed screw driver.



(12) Remove the AMPLIFIER ASSEMBLY (A) by slowly lifting it from the CASE (C) as shown in picture.

V. TRANSPORT MECANISM

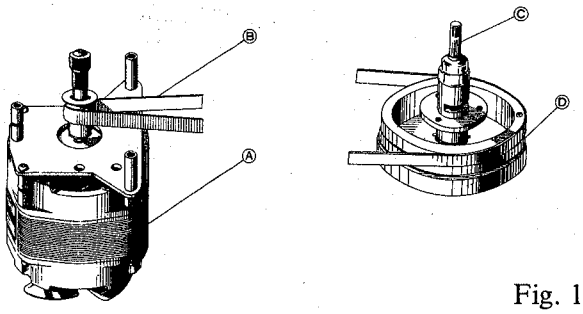


Fig. 1

DRIVING OF CAPSTAN

Figure 1.

Ⓐ Motor
Ⓑ Driving Belt (flat belt)
Ⓒ Capstan
Ⓓ Flywheel

High-speed rotation of *Motor* Ⓐ is reduced by *Driving Belt* Ⓑ and transmitted to Capstan Ⓒ, which is connected with flywheel with ample inertia. This enables the rated rotation to be attained by absorbing minor rotation distortion of the motor itself.

Capstan Rotation :

606 R.P.M. at 7-1/2" (19 cm) per sec.
303 R.P.M. at 3-3/4" (9.5 cm) per sec.
151.5 R.P.M. at 1-7/8" (4.75 cm) per sec.

Motor Rotation :

3,000 to 1,500 R.P.M. at 50 cps.
3,600 to 1,800 R.P.M. at 60 cps.

DRIVING OF PINCH WHEEL

Put tape between rotating capstan and pinch wheel, and push the pinch wheel against the capstan. This will transport the tape at rated speed. The appropriate pressure of pinch wheel is between 1,000 to 1,150 grams at the tape speed of 7-1/2" (19 cm) per second.

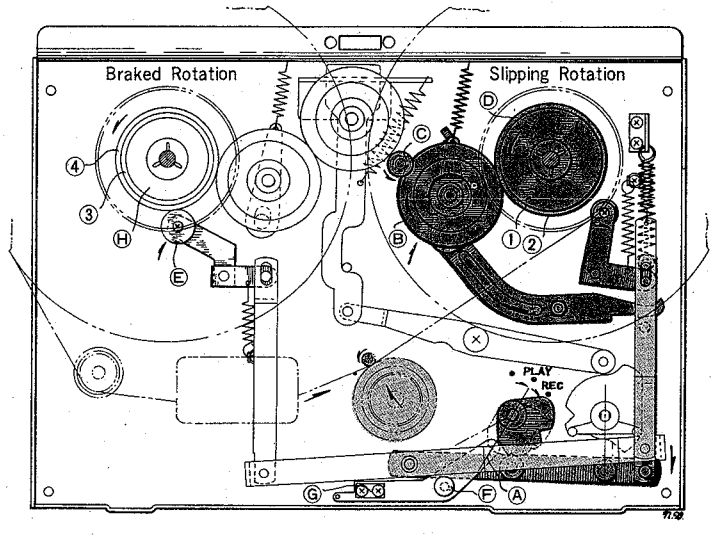


Fig. 2

RECORDING AND PLAYBACK

Turn the RECORD/PLAYBACK KNOB Ⓐ to "PLAY" position, and pinch wheel presses against capstan to move tape at the rated speed. At the same time, *Idler* ⓑ moves between *Motor Bushing* Ⓒ and the *Take-Up Reel Spindle* Ⓓ to transmit *the motor rotation to* Ⓓ so that the tape is moved and wound on the take-up reel.

The Take-up Reel Spindle Base is made up of two plastic rollers (1 and 2) with a clutch felt in between. The Idler is rotating *the plastic roller* ② underneath. Therefore, the tape-winding friction is adjusted by the slipping of the felt to maintain the winding of the tape.

On the other hand, *the Supply Reel Spindle* Ⓗ has *a Brake Roller* Ⓔ hung on the Plastic Roller ④ underneath, which provides appropriate back tension by the felt clutch slipping to the rotation of the Pulley ③ above.

To preven accidental erasure, *the Record Interlock Button* Ⓕ *must be depressed before the RECORD/PLAYBACK KNOB can be moved to the "REC" position. The Safety device* Ⓖ is depressed to operate the recording mechanism.

(See figure 2)

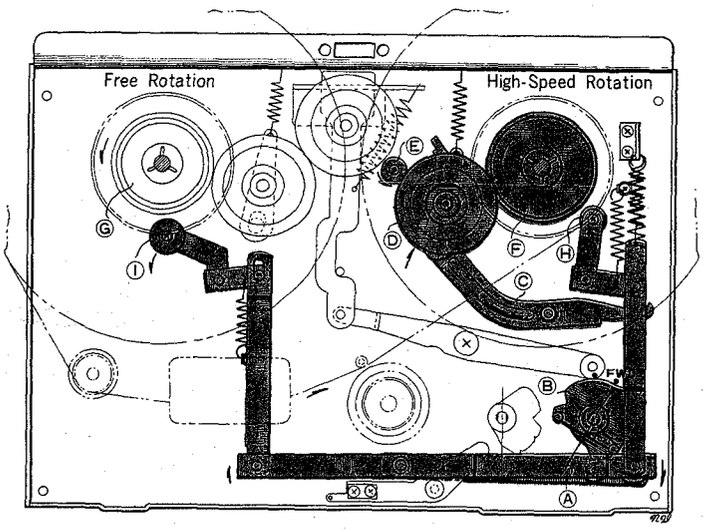


Fig. 3

FAST-FORWARD MECHANISM

Turn *the FAST FWD-REWIND knob* Ⓐ to "FAST FWD" position, and *the cam* Ⓑ under the knob pushes up *the Lever* Ⓒ. *The Idler* Ⓓ moves into the space between *the Plastic Roller* Ⓕ above the Take-Up Reel Spindle and the upper part of the rotating motor drive bushing to transmit the motor rotation to the take-up reel spindle. At the same time, *Brake Rollers* Ⓗ and Ⓘ come off the reel spindle to free *the Supply Reel Spindle* Ⓖ, thereby allowing fast winding of the tape onto the take-up reel.
(See figure 3)

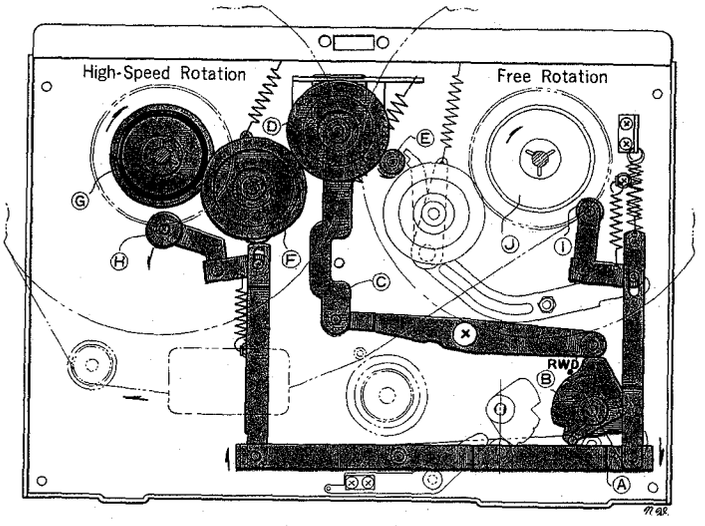


Fig. 4

REWIND MECHANISM

Turn *the FAST FWD-REWIND knob* Ⓐ to "REWIND" position, and *the cam* Ⓑ under the knob pushes *the Lever* Ⓒ up. *The Idler* Ⓓ moves into the space between the upper part of the rotating *Motor drive bushing* Ⓔ and *the Intermediate Pulley* Ⓕ to transmit the high-speed rotation of the motor through the intermediate pulley to *the Supply Reel Spindle* Ⓖ. At the same time, *Brake Rollers* Ⓗ and Ⓘ come off the reel spindle to free *the take-up reel spindle* Ⓙ, thereby rewinding the tape into the supply reel at a fast speed.
(See figure 4)

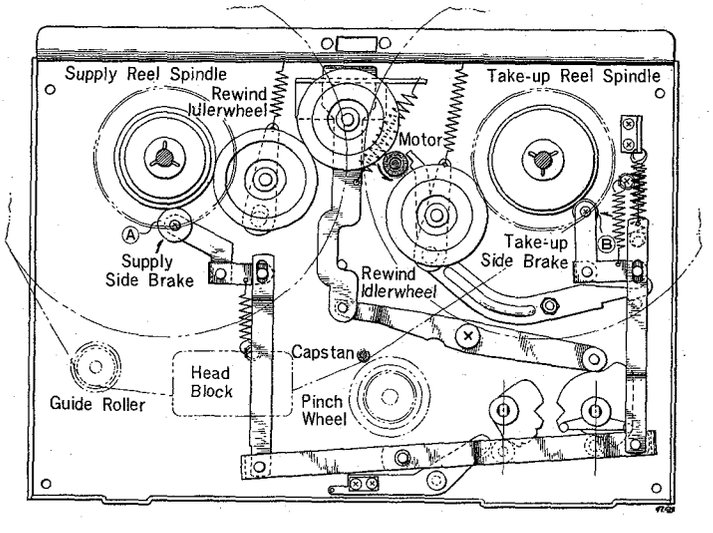


Fig. 5

STOP CONTROL

Push the stop lever to "STOP" position, *Brake Roller* Ⓐ and Ⓑ depress reel spindles to stop rotation of the reel spindles.
As the brake rubber depresses the plastic rollers under the reel spindles, no friction is brought to bear on the tape itself.

Modes of Operation	Pinch Wheel	Take-up Idler Wheel	Rewind Idler Wheel	Take-up side Brake	Supply side Brake
(a) STOP	X	X	X	O	O
(b) FAST-FORWARD	X	O	X	X	X
(c) REWIND	X	X	O	X	X
(d) RECORDING PLAYBACK	O	O	X	X	O

NOTES : X-marks indicates "open" and
O-marks "engaged"

RECORD/PLAYBACK CHANGING MECHANISM ((A) TYPE)

By turning the RECORD/PLAYBACK KNOB Ⓝ to the recording position, the CAM ⓐ pushes the RECORDING LEVERS ⓑ, ⓒ, ⓓ and ⓔ, as illustrated in dotted line, then the RECORD/PLAYBACK CHANGING SWITCHES (SW1) and (SW2) turn to recording position. If the LEVERS ⓑ and ⓒ do not push the LEVERS ⓓ and ⓔ properly, the (SW1) and (SW2) do not operate properly, so abnormal oscillation may occur and also recording cannot take place.
The LEVER ⓒ must be adjusted to proper position by checking the SCREWS ⓕ and ⓖ.

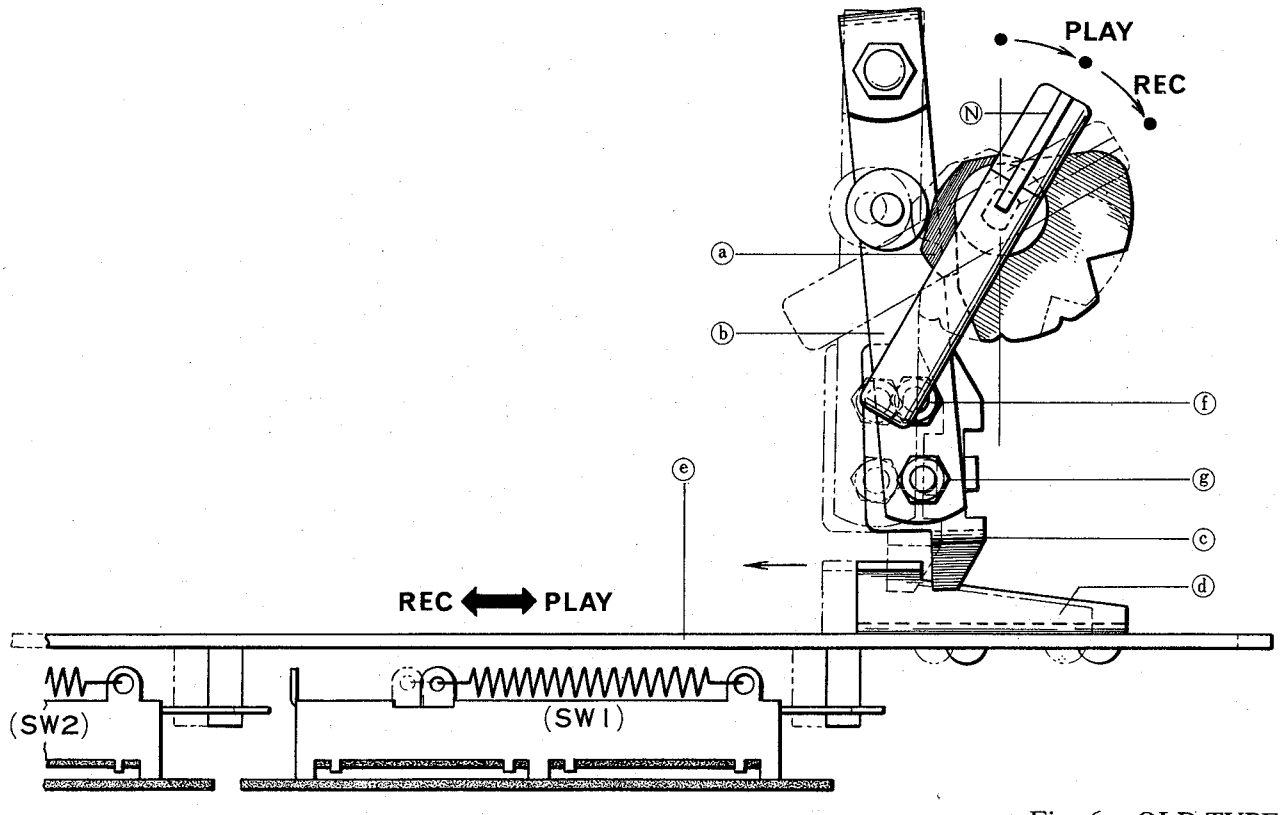


Fig. 6 OLD TYPE

RECORD/PLAYBACK CHANGING MECHANISM ((B) (C) TYPE)

By tunring the RECORD/PLAYBACK KNOB Ⓝ to the recording position the CAM ⓐ pushes the RECORDING LEVERS ⓑ, ⓒ and ⓓ, as illustrated in dotted line, then the RECORD/PLAYBACK CHANGING SWITCHES (SW4-1) and (SW4-2) turn to recording position.

If the LEVERS ⓑ and ⓒ do not push the LEVERS ⓓ properly, the (SW4-1) and (SW4-2) do not operate properly, so abnormal oscillation may occur and also recording cannot take place.

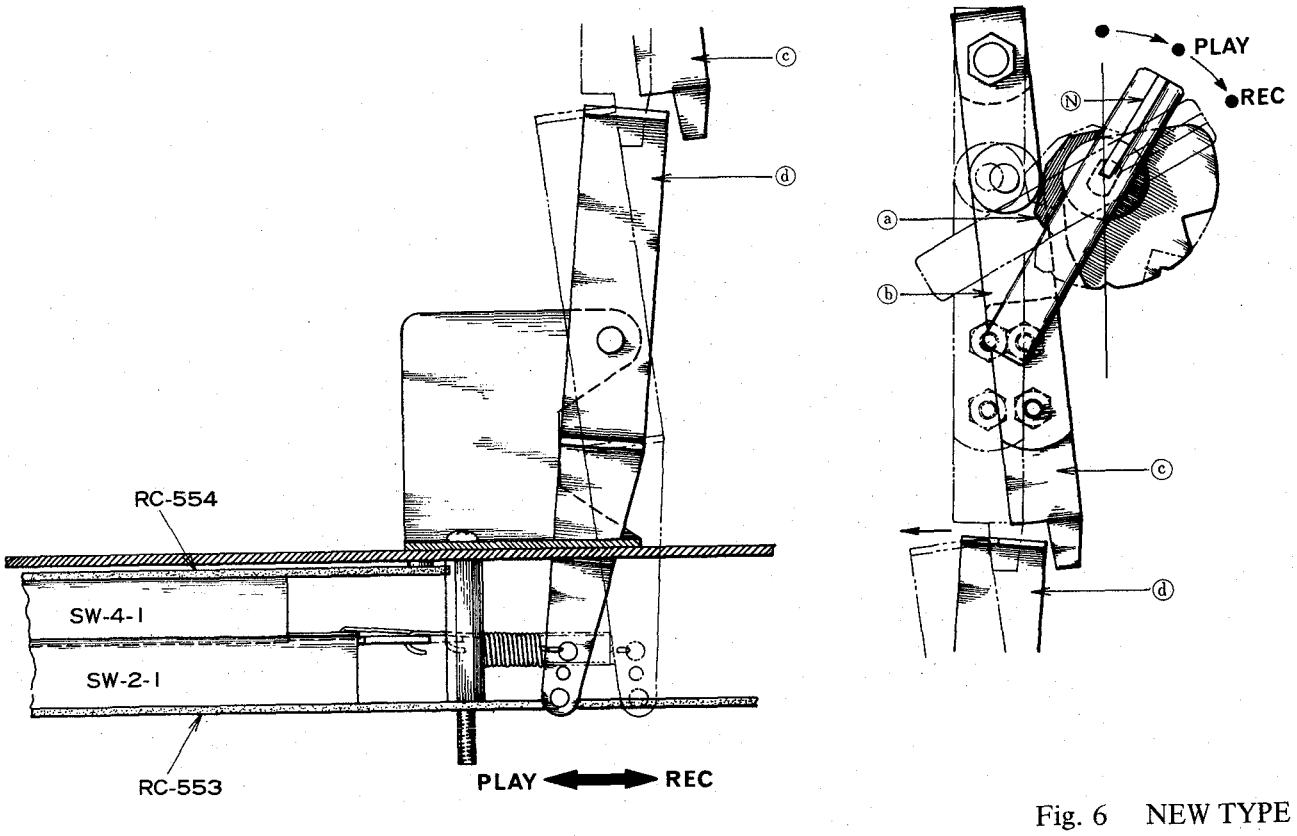


Fig. 6 NEW TYPE

VI. MECHANISM ADJUSTMENT

1. ADJUSTMENT OF PINCH WHEEL

It is important that the pinch wheel shaft is kept in complete alignment with the capstan shaft. A proper pinch wheel pressure is between 1,000 and 1,150 grams when the unit is operated at the tape speed of 7-1/2 ips. Any deviation from this specification will result in wow and flutter. Check pinch wheel pressure by a spring scale, and if necessary, adjust the pinch wheel load spring.

2. ADJUSTMENT OF TAKE-UP IDLER WHEEL

The take-up idler wheel must be kept in complete a alignment with the take-up reel shaft. When the unit is set in fast forward condition, the idler wheel will contact with the upper knurled wheel of the take-up reel shaft assembly, and it will contact with the lower knurled wheel during record or play operation. Adjust idler wheel load spring so that the idler wheel pressure is kept between 50 and 80 grams. The idler wheel rapidly wears if the pressure is excessive. Slippage occurs if the pressure is smaller than the specification.

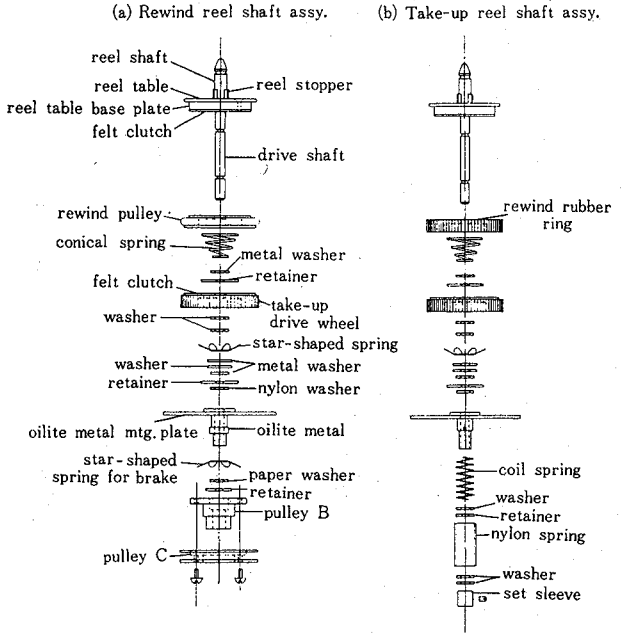


Fig. 1

3. ADJUSTMENT OF REWIND IDLER WHEEL

The rewind idler wheel must be kept in complete alignment with the rewind reel shaft. The amount of pressure on the knurled motor bushing should be maintained at about 50 grams during rewind operation. Adjust both the idler load spring and rewind roller.

4. ADJUSTMENT OF INTERMEDIATE WHEEL

The intermediate wheel is located between the rewind idler wheel and the rubber ring which is used on the upper part of the supply reel shaft assembly. When the unit is set in rewind condition, it will contact with these parts simultaneously transmitting torque of motor. An adequate pressure is 50 grams. Adjust the load spring of the intermediate wheel if the pressure is not sufficient.

5. ADJUSTMENT OF TAKE-UP REEL SHAFT ASSEMBLY

Felt clutch material is attached to the bottom side of the reel table base plate so that recording tape will not be stretched during fast forward operation because of excessive tension. To check the amount of friction of this part, place a 5-inch reel with a tape 60 m/m in diameter, and gently pull the end of tape upward using a spring scale. Adjust the conical spring so that the amount of tension at this part will be kept between 400 and 500 grams. Other felt clutch material is attached to the tape-up drive wheel. It is to provide proper slipping operation during record or play operation. The precedure for checking friction of this part is the same as the foregoing, and between 150 and 200 grams of friction will provide the best result. Adjust the star-shaped spring just under the take-up drive wheel. When the unit is set the rewind operation, the amount of friction of this part will be greatly reduced and will become 15 to 20 grams. Check to see whether this is satisfactory, if not, readjust the star-shaped spring for Brake, and the pressure of the spring retainer will be adjusted accordingly.

6. ADJUSTMENT OF SUPPLY REEL SHAFT ASSEMBLY

Felt clutch material is used between the lower side of the reel table base plate and the rewind rubber ring to protect recording tape from excessive tension during the rewind operation. To check the amount of friction of this part, place onto the supply reel table a 5-inch reel with a tape 60 m/m in diameter, and gently pull the end of tape upward by a spring scale. Adjust the conical spring so that the amount of tension is kept between 400 and 500 grams. Other felt clutch material is attached to the rewind drive wheel to provide proper slipping operation during record or play operation. The procedure for checking friction of this part is the same as the foregoing, and between 100 and 125 grams of friction will give the best result. When the unit is set to fast forward operation, the amount of friction will be greatly reduced and will become 15 to 20 grams.
Check to see whether this is correct. If not, readjust coil spring and spring retainer washer. (See figure 1 (a) at left)

7. ADJUSTMENT OF HEADS

(A) Reel

a) Azimuth alignment of the Recording/Playback Head (See Fig. 2)
Playback an Ampex Alignment Tape 8,000 Hz at 7-1/2" tape speed and turn the screw (A) until the Line Out-Put Level reaches the Maximum.

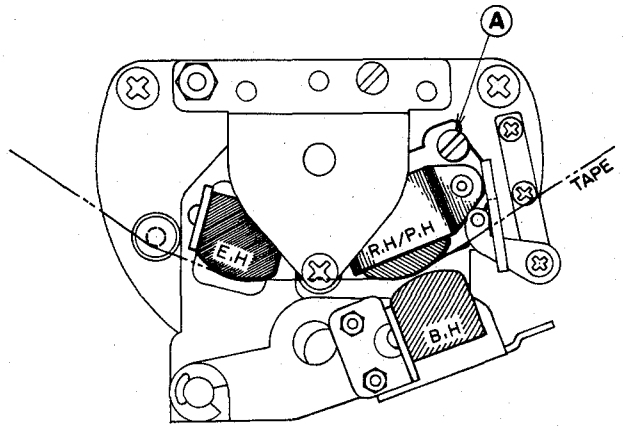


Fig. 2

b) Angle of the Bias Heas (See Fig. 2 and Fig. 4)
Un fasten two screws and move the Bias Head by hand until the center line (d) of the Bias Head makes and angle of 90° with the direction of the tape. Then fasten screws.

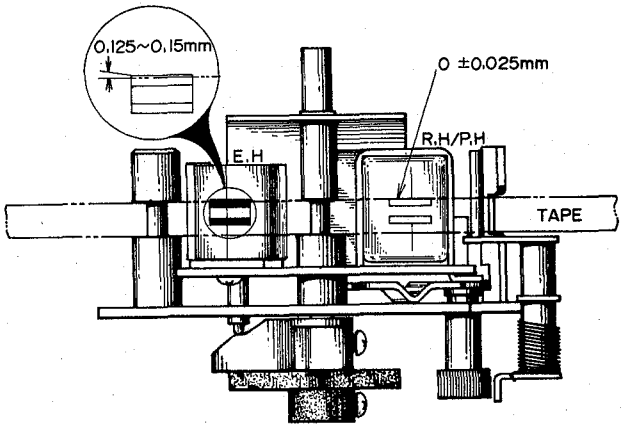


Fig. 3

c) Clearance of the Bias Head (See Fig. 5)
Unfasten two screws and move the Bias Head by hand until the clearance (f) and (g) reaches 0.2 ~ 0.3 mm. Then fasten screws.
Note : If the clearance (f) and (g) becomes less than 0.2 ~ 0.3 mm, the Frequency Characteristic will be too low, but Distortion will decrease. If the clearance (f) and (g) becomes more than 0.2 ~ 0.3 mm, the Frequency Characteristic will be too high, but Distortion will increase.

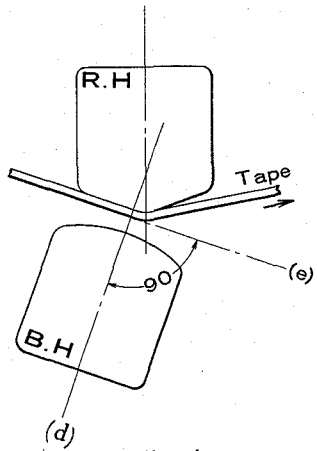


Fig. 4

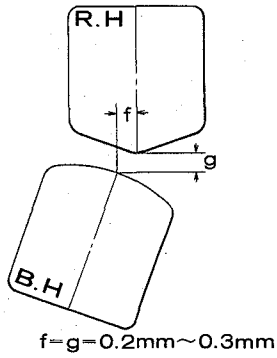


Fig. 5

(B) Cartridge

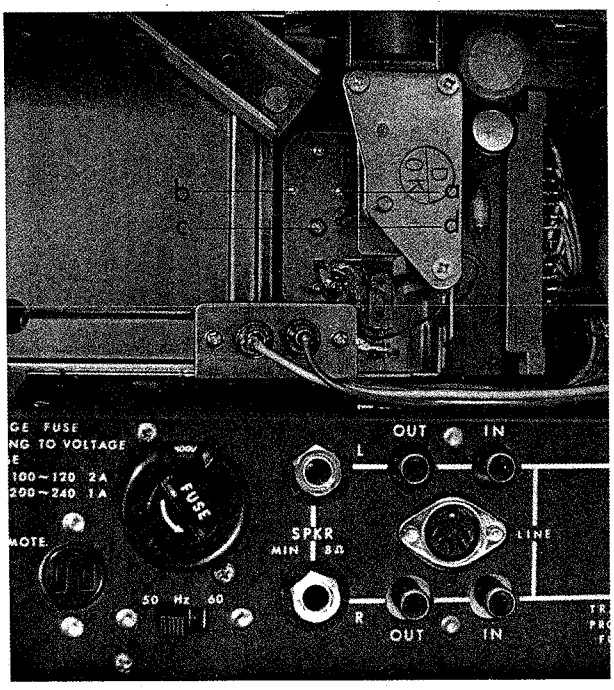
1) ADJUSTMENT OF AZIMUTH ALIGNMENT
Playback the test tape for azimuth alignment (8,000 Hz recorded tape) and set the azimuth alignment of head assembly by turning the screw (c) until maximum playback output of program 2 or 3 is obtained.

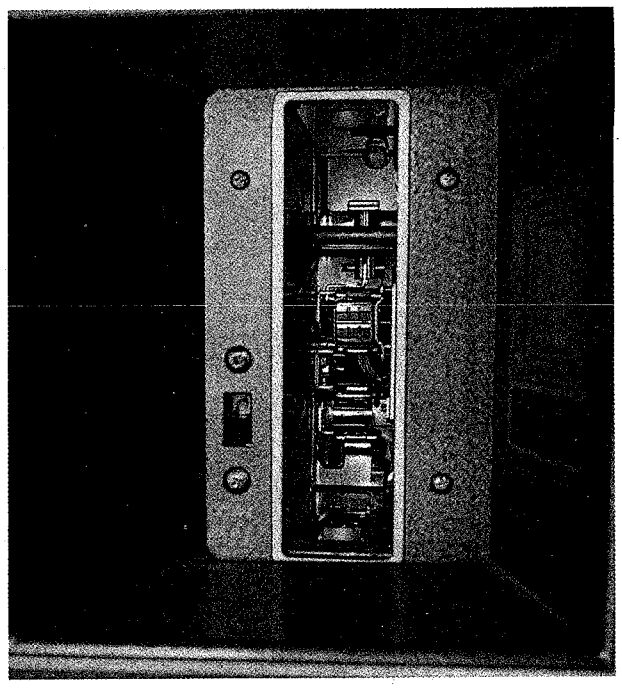
2) ADJUSTMENT OF HEIGHT
(A) Playback *the test tape and turn the screw (d) until the maximum gain of program 1 is obtained.
(B) Set *the blank test tape to the recorder and put to the erasing test. If the erasing is not complete, adjust it as follows :
(I) Turn the screws (a) and (b) clockwise forty-five degrees at the same time and then put to the erasing test again.
Note : Care should be taken to demagnetize the blank test tape every time you put to the erasing test.
(II) If the erasing is not completely done after the above adjustment, turn again the screws (a) and (b) clockeise ten to fifteen degrees at the same time.
(III) If not, continue as (2), till you can get complete erasing. And playback the test tape for azimuth alignment again and turn the screw (c) until the maximum gain of program 2 or 3 is obtained.
(IV) Playback again *the test tape and turn the screw (d) until the maximum gain of program 1 is obtained.

* TEST TAPE
This test tape is specially designed to make an adjustment of the height by AKAI.

Program 1	1,000 Hz
Program 2	Blank
Program 3	1,000 Hz
Program 4	3,000 Hz

* BLANK TEST TAPE
This blank test tape is specially designed to have one rotation at fifteen seconds.





VII. AMPLIFIER ADJUSTMENT

1. ADJUSTMENT OF RECORDING BIAS FREQUENCY (See Fig. 1)

a) Put on the resistor 10 or 50 Ohms in series with the Bias Head and connect the Vertical Input Terminal of the Oscilloscope to points (a) and (b).

b) Feed in the sine wave signal from an Audio Frequency Oscillator to the Horizontal Input of the Oscilloscope and tune the Dial of the Audio Frequency Oscillator until the Oscilloscope displays a circular or linear pattern. Then read the figure on the Dial of the Audio Frequency Oscillator.

c) If it reads 60 K.Hz, the Recording Bias Frequency is correct.

d) If it is not correct, it may be adjusted by inserting another condenser (C-401) ((C405)) value 7000 ((8000)) PF.

2. ADJUSTMENT OF RECORDING BIAS VOLTAGE

a) Reel (See Fig. 2)
Connect the V.T.V.M. to the point (a) and adjust the recording bias voltage by turning the V.A.C. in the bias oscillator circuit until it reads the voltage stamped backside the head assembly.
Note : There is no way of adjusting the erasing bias voltage, but the correct bias voltage is between AC 25 to 30 V.

b) Cartridge (See Fig. 2)
Connect the V.T.V.M. to the point (b) and if it not reads correct bias voltage between AC 12 to 15 V, it may be adjusted by inserting another resistor (R-103, R-104) ((R2-13)) value (180) ((220)) K. Ohms.

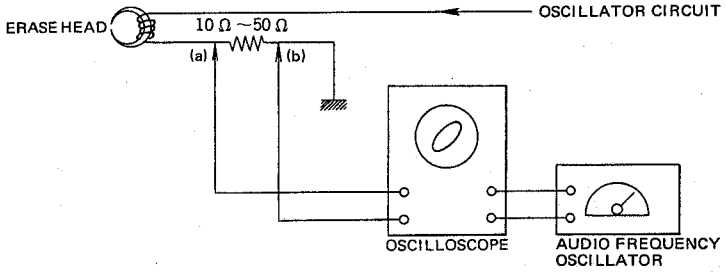


Fig. 1

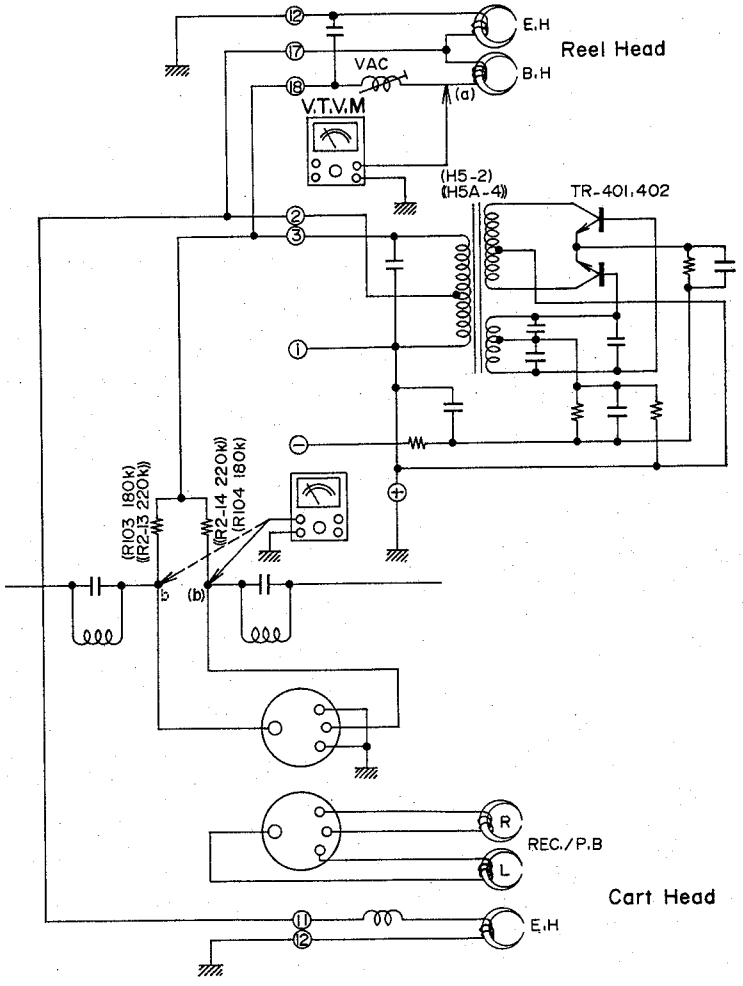


Fig. 2

3. ADJUSTMENT OF LINE OUTPUT LEVEL (Reel only)

(A) Play Back (See Fig. 3)

1. Push the Reel Button of Mode Selector in and turn the Volume Control (VR-2) ((VR0-1a)) (10 KA) up to the maximum position.
2. Set the Record/Playback Knob to "Play" position and the Equalizer Switch to 7-1/2".
3. Connect the V.T.V.M. (use one with Milli-Volt scale) to the Line Output Jack.
4. Playback the test tape (250 Hz "0" VU recorded) at 7-1/2" tape speed and turn the volume (VR-201) ((VR1-1)) (20 KB) until the Line Output level reaches +4 dB 1.228 V.

(B) Recording and Playback for REEL (See Fig. 4)

1. Connect V.T.V.M. to the Line Output Jack and put on a Scotch-150 blank tape.
2. Set the Record/Playback Knob to "REC" position and the Equalizer Switch to 7-1/2". Turn the Volume Control ((VR0-1a, 10 KA)) up to the maximum position.
3. Feed in a 1000 Hz sine wave signal from an Audio Frequency Oscillator through the attenuator to the Line Input of the X-1800SD and adjust the attenuator so that the VU Meter needle indicates "0".
4. After a few seconds of recording, rewind the tape back to the starting position. Then playback the tape.
5. If the Line Output Level does not reaches +4 dB 1.228 V, turn the Volume ((VR-202, 2 KB)) until the Line Output Level reaches +4 dB. Repeat this process 2 or 3 times as indicated in 3.

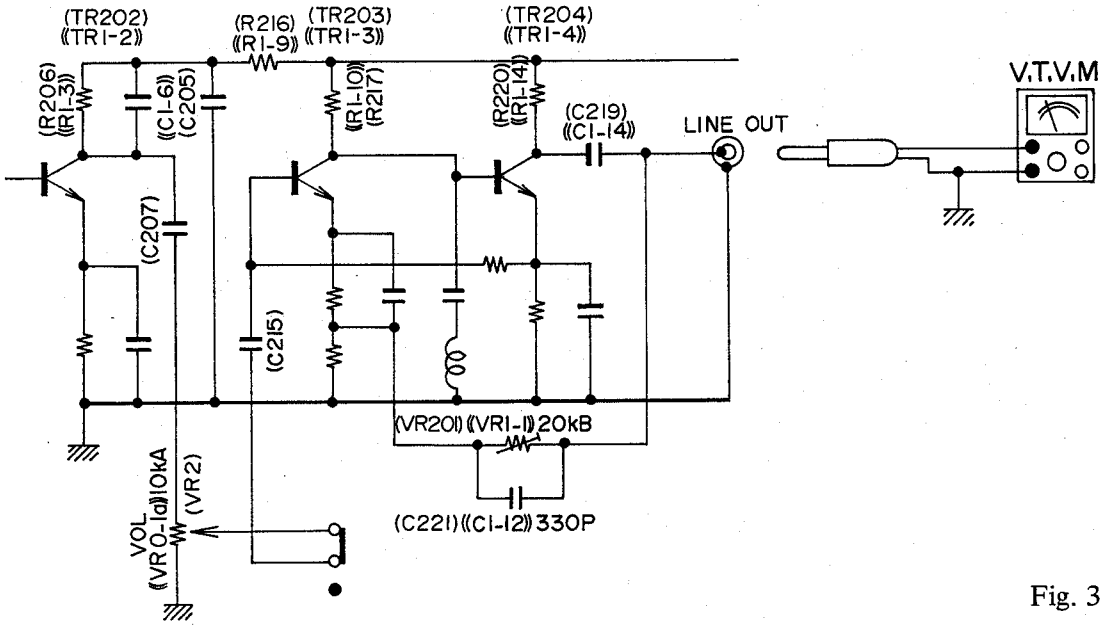


Fig. 3

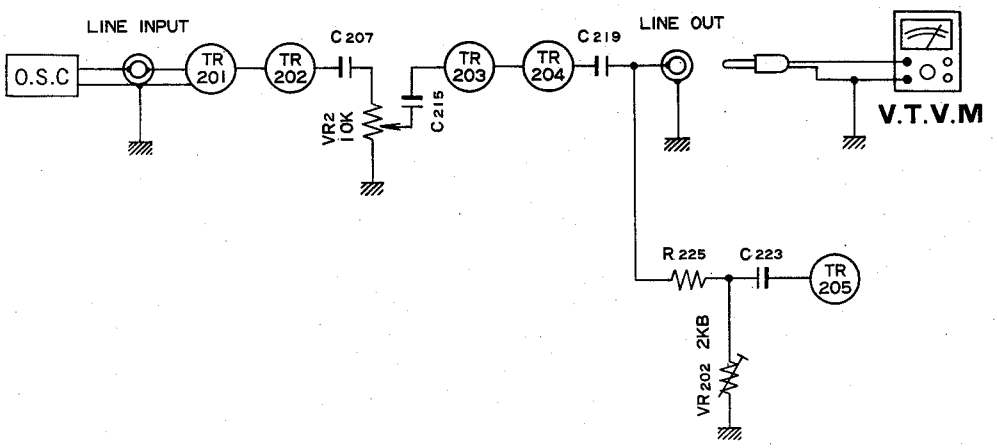


Fig. 4 OLD TYPE

(B) (C) TYPE ONLY

(C) Recording and Playback for CARTRIDGE (See Fig. 4)

1. Set the blank test tape to the recorder.
2. Depress the cartridge function switch and set the Record/Play Knob to "REC" position.
3. Follow the precess of (3) - (5) in (B). (Adjusting volume is VR2-1 10 K.ohm, this time.) Line Output Level of Cartridge will be lower than the one of Reel. (–3, –4 dB is acceptable.)

4. ADJUSTMENT OF D.C. COLLECTOR CURRENT FOR POWER TRANSISTORS 2SB463 WITH NO INPUT SIGNAL (See Fig. 5)

a. Disconnect the wire between points (a) and (b).
b. Connect the Ampere Meter (use one with Milli-Ampere Scale) to the points (a) and (b).
c. Connect the V.T.V.M. (use one with Milli-Volt Scale) to the points (a) and (c), (c) and (d).
d. Turn the Volume Control (VR-2) ((VR0-1a)) (10 KA) back to the minimum position.
e. Turn the Volume (VR-301) ((VR3-1) and (VR-302) ((VR3-2)) (300-B) until the D.C. Collector Current reaches 18 mA and both of V.T.V.M. shows the same value approximately 14 V.D.C. at the same time.

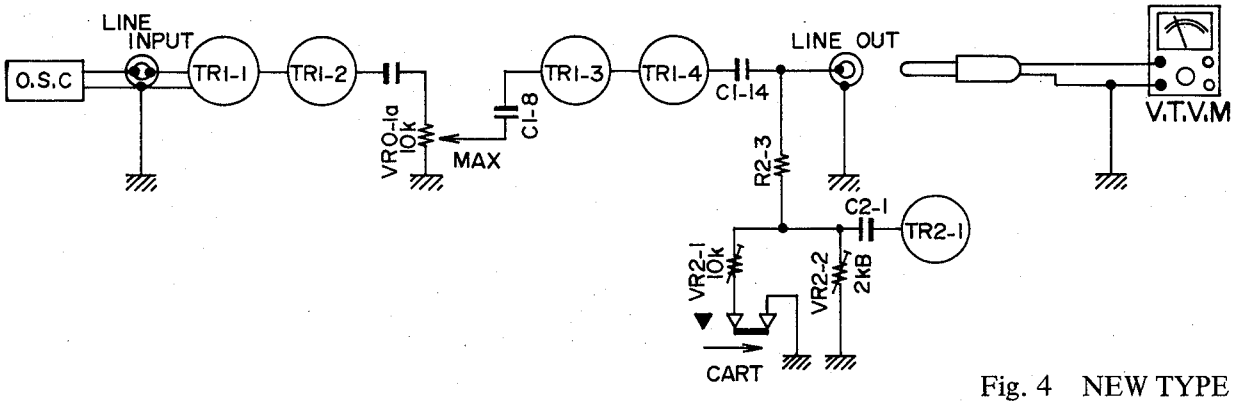


Fig. 4 NEW TYPE

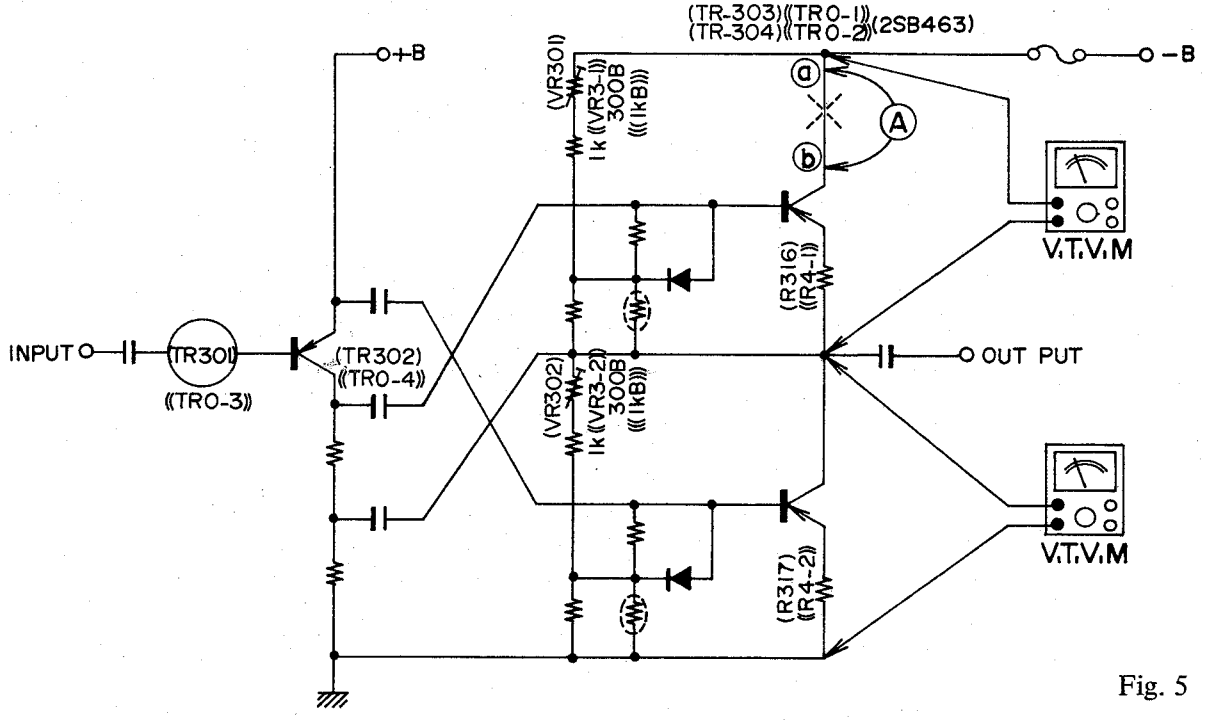


Fig. 5

VIII. MAINTENANCE PROCEDURES

1. LUBRICATION INSTRUCTION

For maximum service life and optimum performance, lubricate the parts identified below after each 500 hours of operation. Use only light machine oil of good quality.

Motor

Flywheel Assembly

Rewind Idler Wheel and Wind Take-Up Idler 1 drop

Intermediate Idler 1 drop

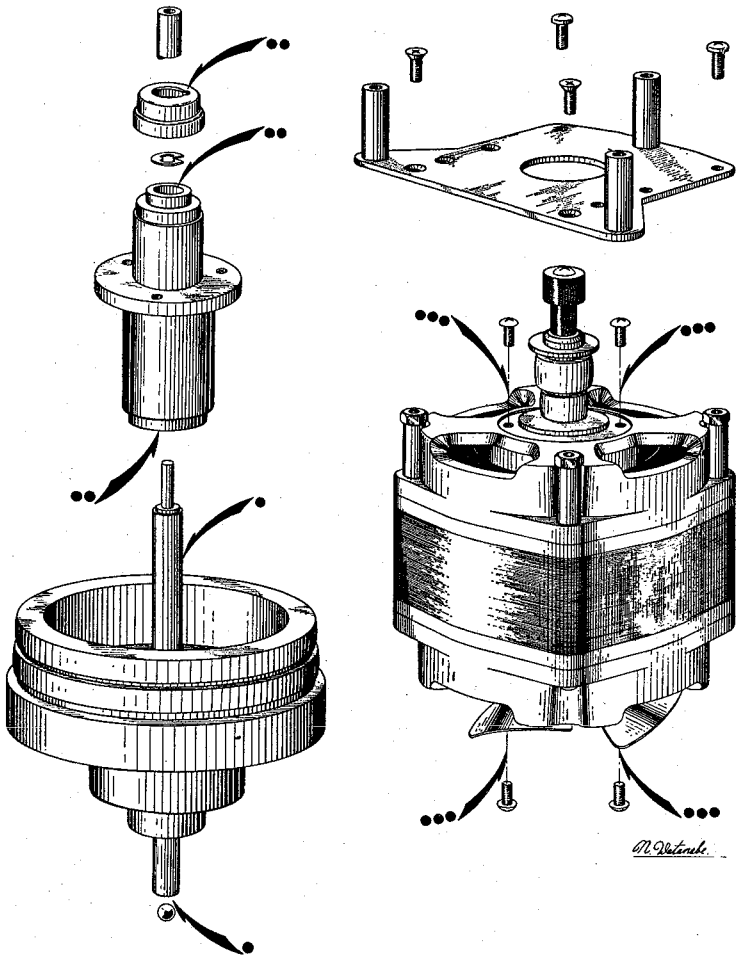
Pinch Wheel 1 drop

Also apply a liberal film of light machine grease to each roller surface of all levers and cams.

CAUTION : DO NOT OVER-LUBRICATE, AND WIPE OFF EXCESS OIL WITH A COTTON SWAB SOAKED IN ALCOHOL. OTHERWISE, THE EXCESS LUBRICANT MAY BE SCATTERED DURING OPERATION. AND THE RUBBER COMPONENT PARTS WILL DETERIORATE.

2. CLEANING TAPE HEADS AND OTHER PARTS

Wipe surface of tape heads, guide roller bearing, capstan bushing and pinch wheel periodically with a soft cloth soaked in alcohol or carbon-tet.

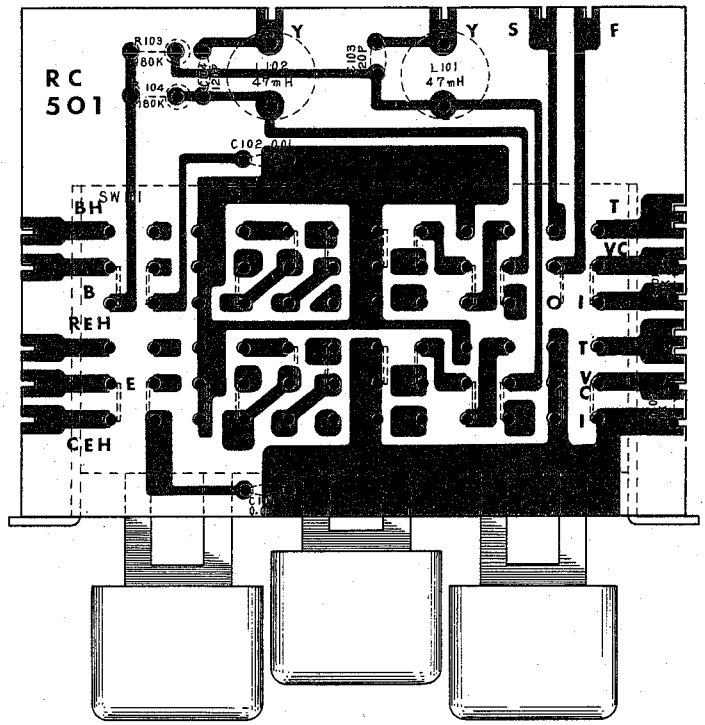


FLYWHEEL ● 1 drop MOTOR

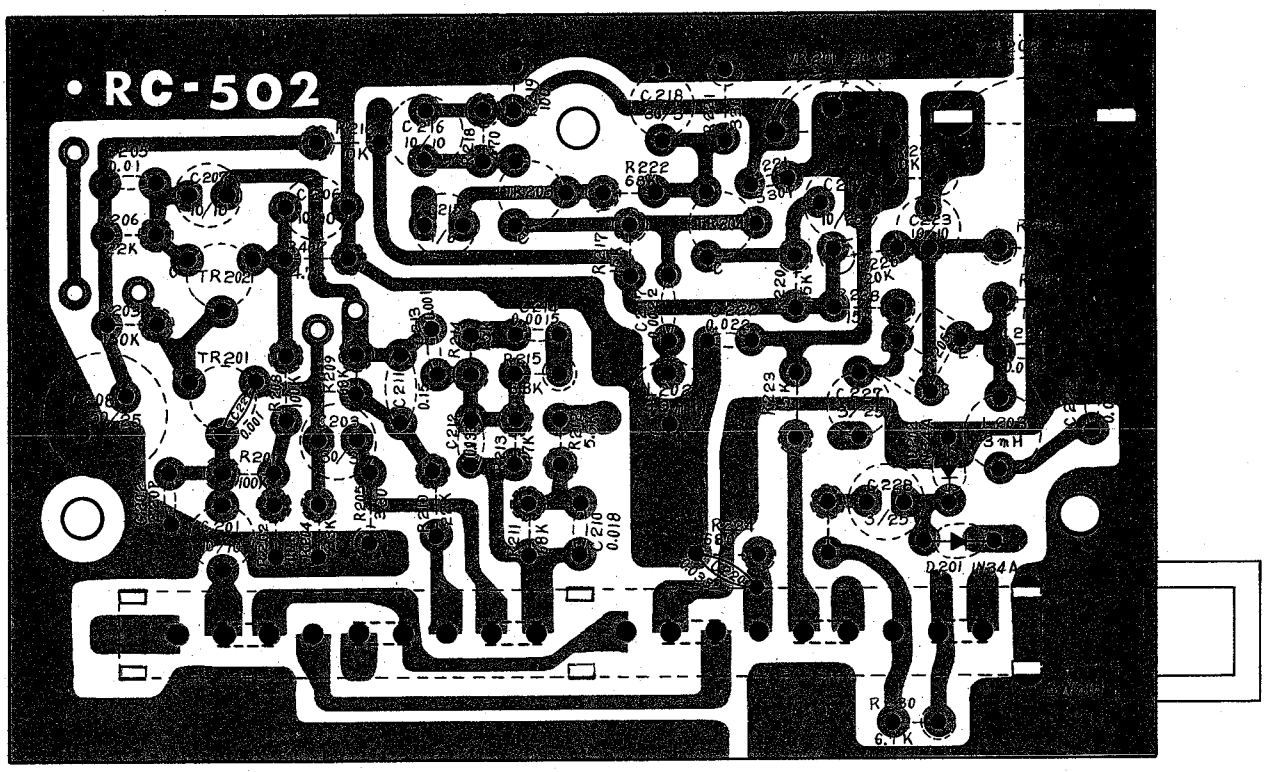
IX. COMPOSITE VIEWS OF COMPONENTS

CARD \ TYPE	(A) TYPE 00000 → 66477	(B) TYPE 66478 → 124677	(C) TYPE B-41203 →
RC-501 (SWITCH)	○		
RC-502 (P.B./REC)	○		
RC-550 (P.B.)		○	○
RC-503 (MAIN AMP.)	○		
RC-551 (MAIN AMP.)		○	
RC-589 (MAIN AMP.)			○
RC-554 (MAIN CHASSIS)		○	○
M9-504 (O.S.C.)	○	○	
MR-505 (O.S.C.)		○	○
RC-553 (REC/MODE SWITCH)		○	○
RC-555 (LAMP)		○	○
CART. HEAD Assy.	○		
CART. HEAD Assy. (RC-79)		○	○
CASE (Connector Left Side)	○		
CASE (Connector Right Side)		○	○
SCHEMATIC DIAGRAM (A)	○		
SCHEMATIC DIAGRAM (B)		○	
SCHEMATIC DIAGRAM (C)			○

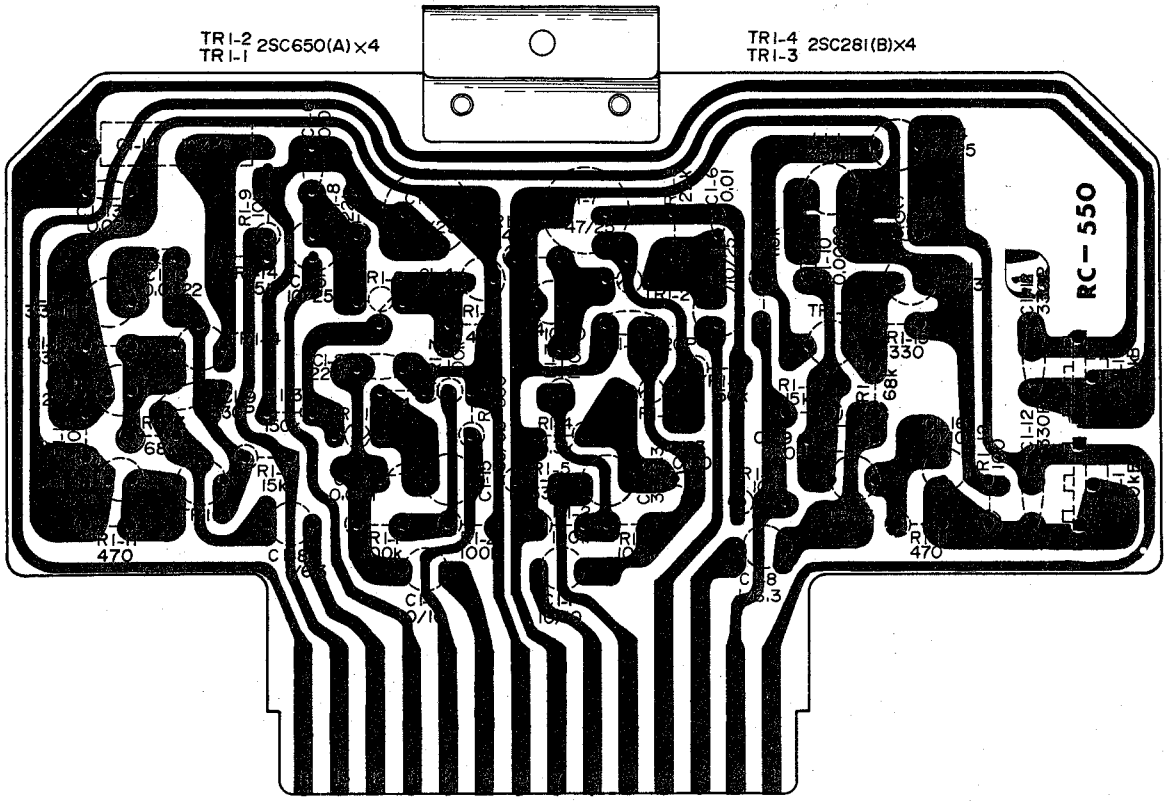
RC-501 SWITCH PRINTED CARD
((A) TYPE)



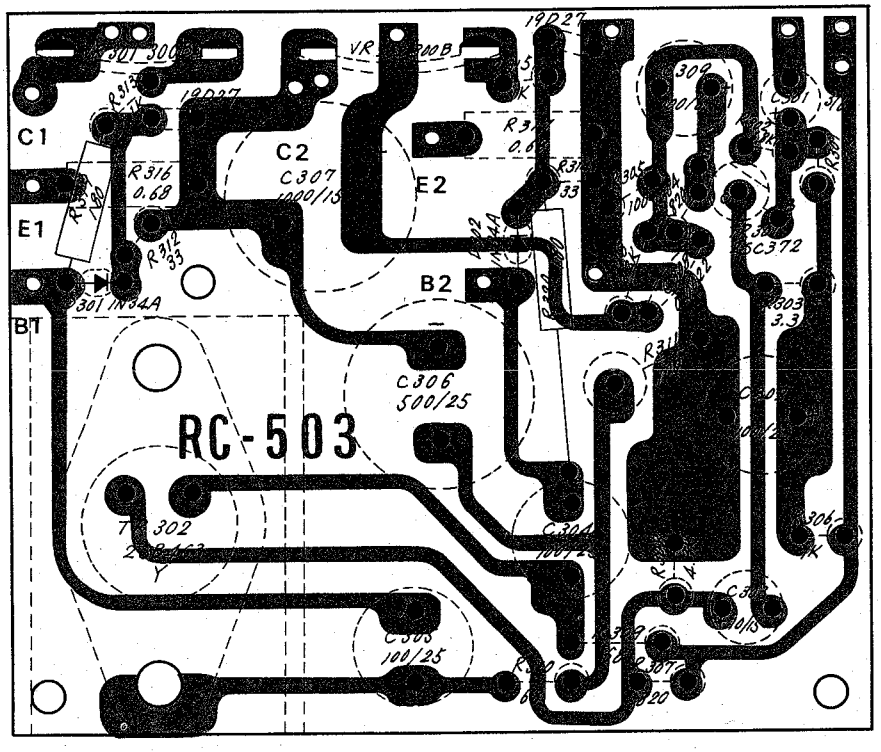
RC-502 P.B./REC. PRINTED CARD
((A) TYPE)



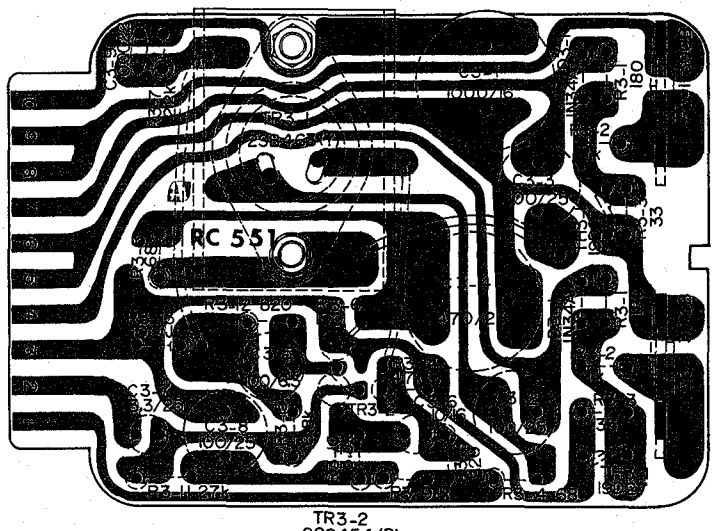
RC-550 P.B. PRINTED CARD
((B) (C) TYPE)



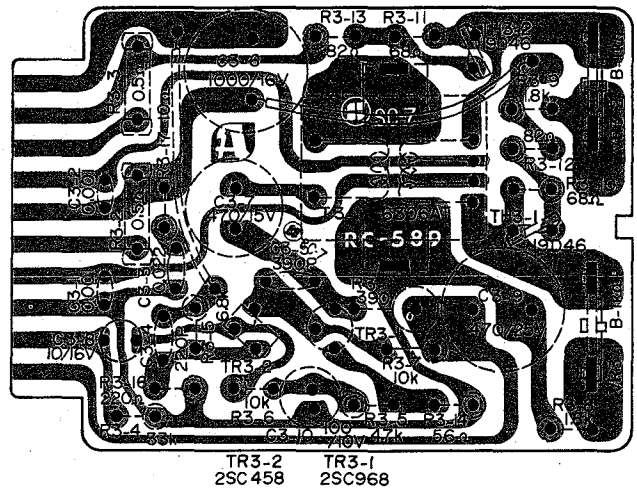
RC-503 MAIN AMP. PRINTED CARD
((A) TYPE)



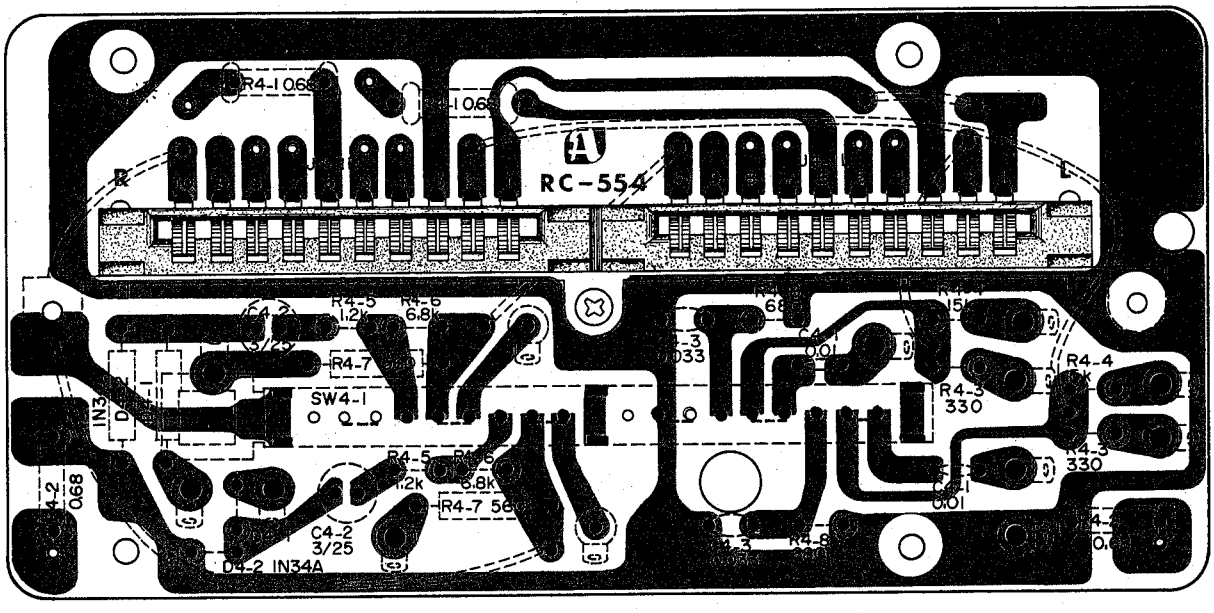
RC-551 MAIN AMP. PRINTED CARD
((B) TYPE)



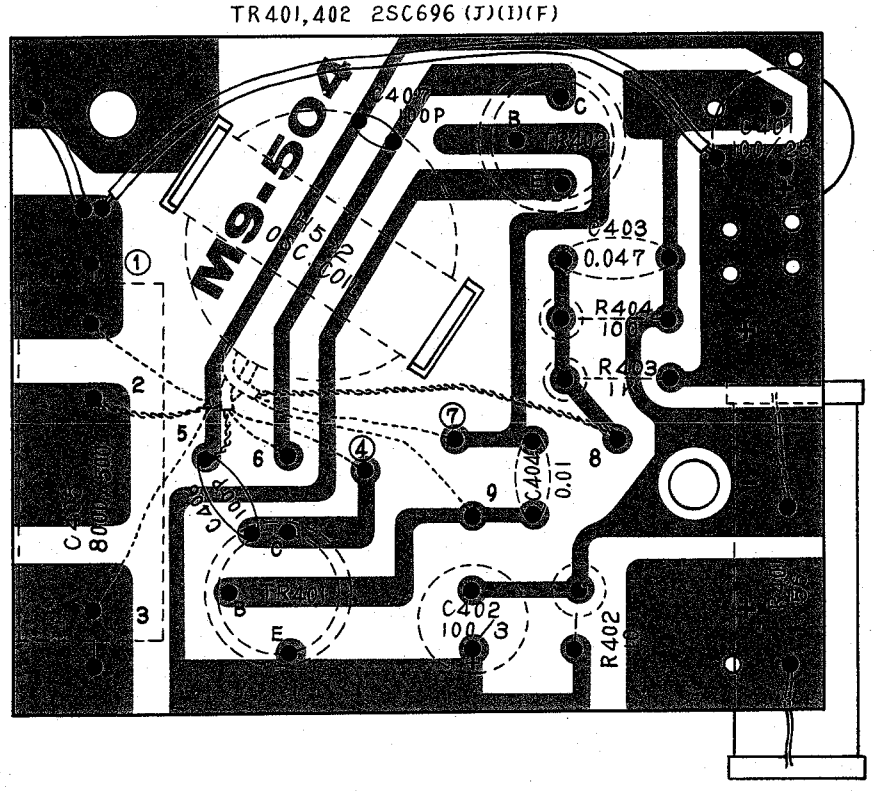
RC-589 MAIN AMP. PRINTED CARD
((C) TYPE)



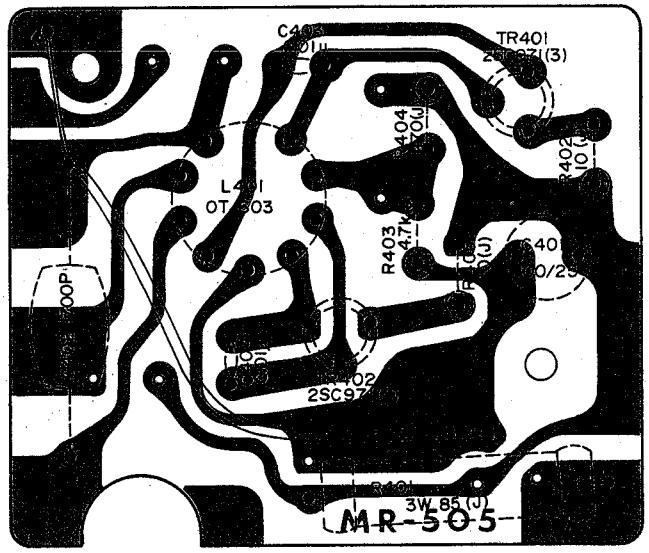
RC-554 MAIN AMP. CHASSIS BOARD
((B) (C) TYPE)



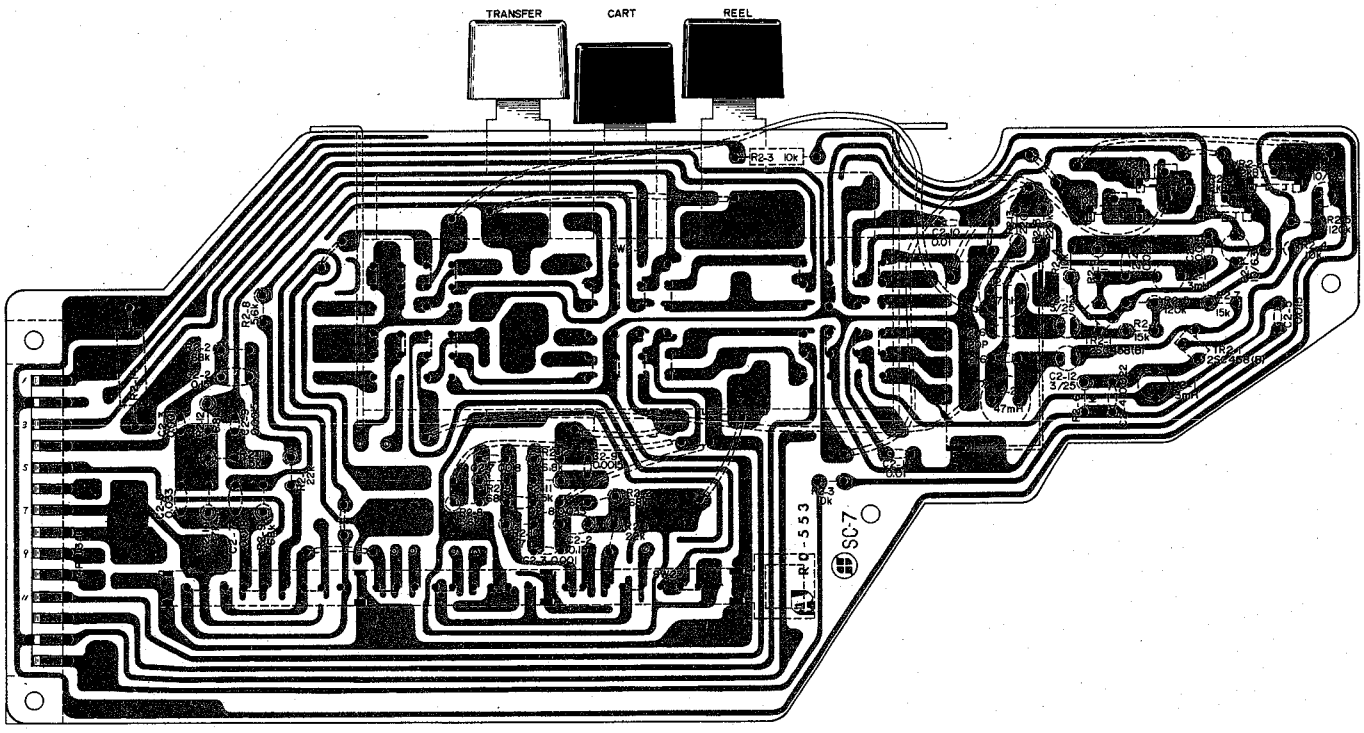
M9-504 O.S.C. PRINTED CARD
((A) (B) TYPE)



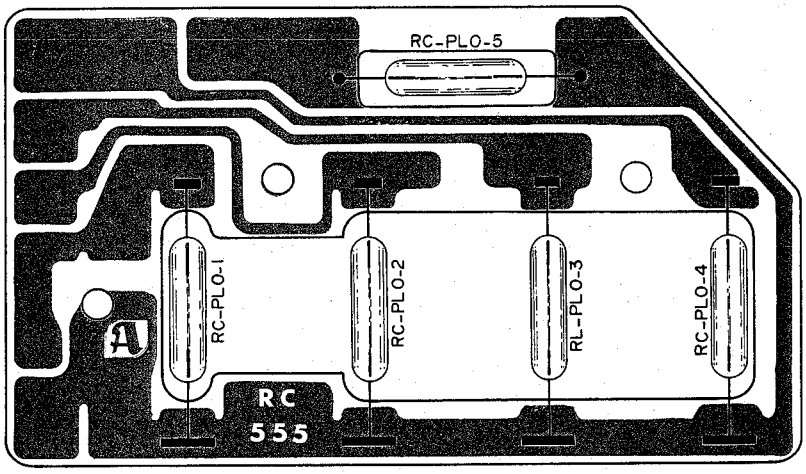
MR-505 O.S.C. PRINTED CARD
((B) (C) TYPE)



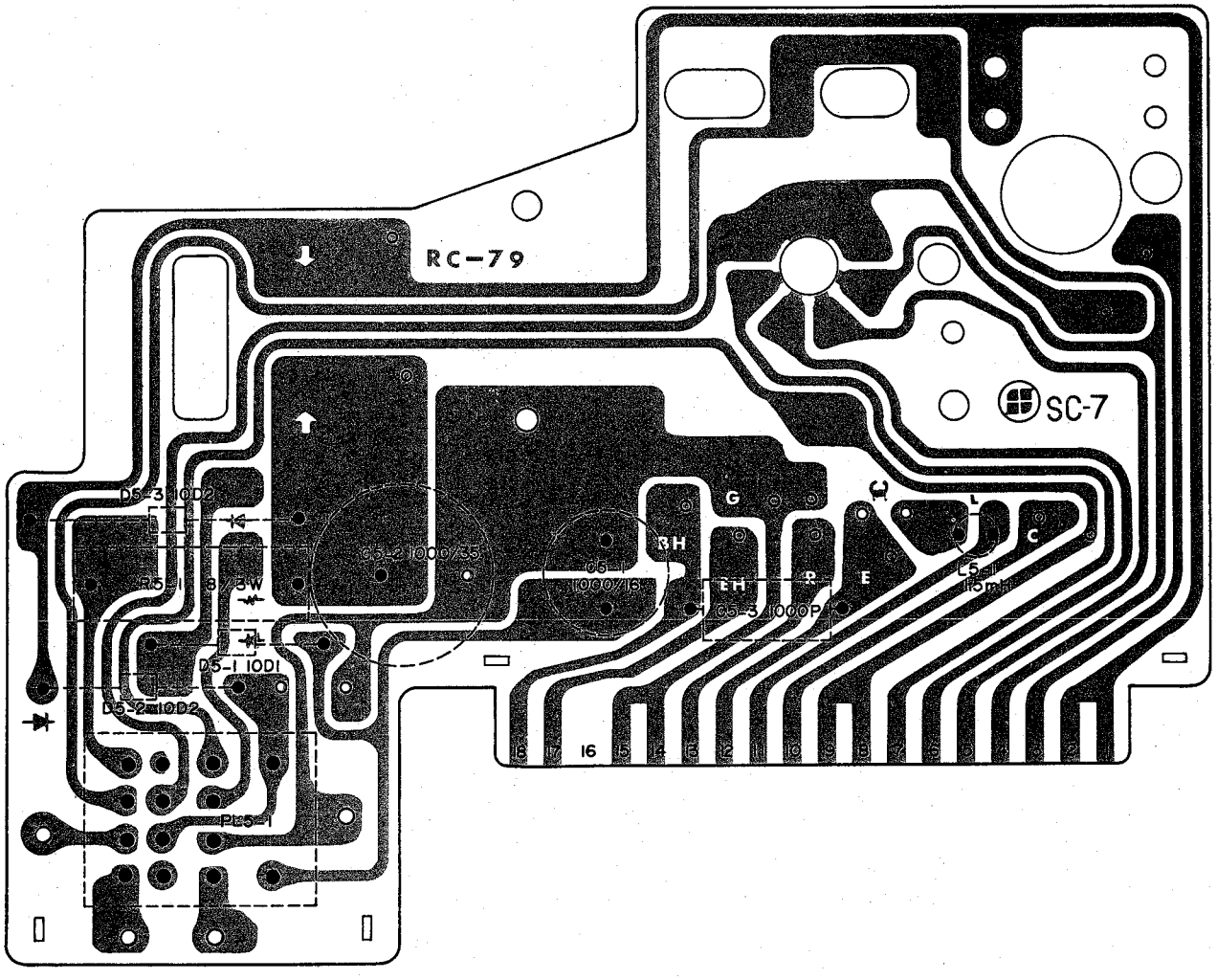
RC-553 REC. PRINTED CARD
((B) (C) TYPE)



RC-555 LAMP PRINTED CARD
((B) (C) TYPE)



RC-79 CAPT. HEAD CARD
((B) (C) TYPE)

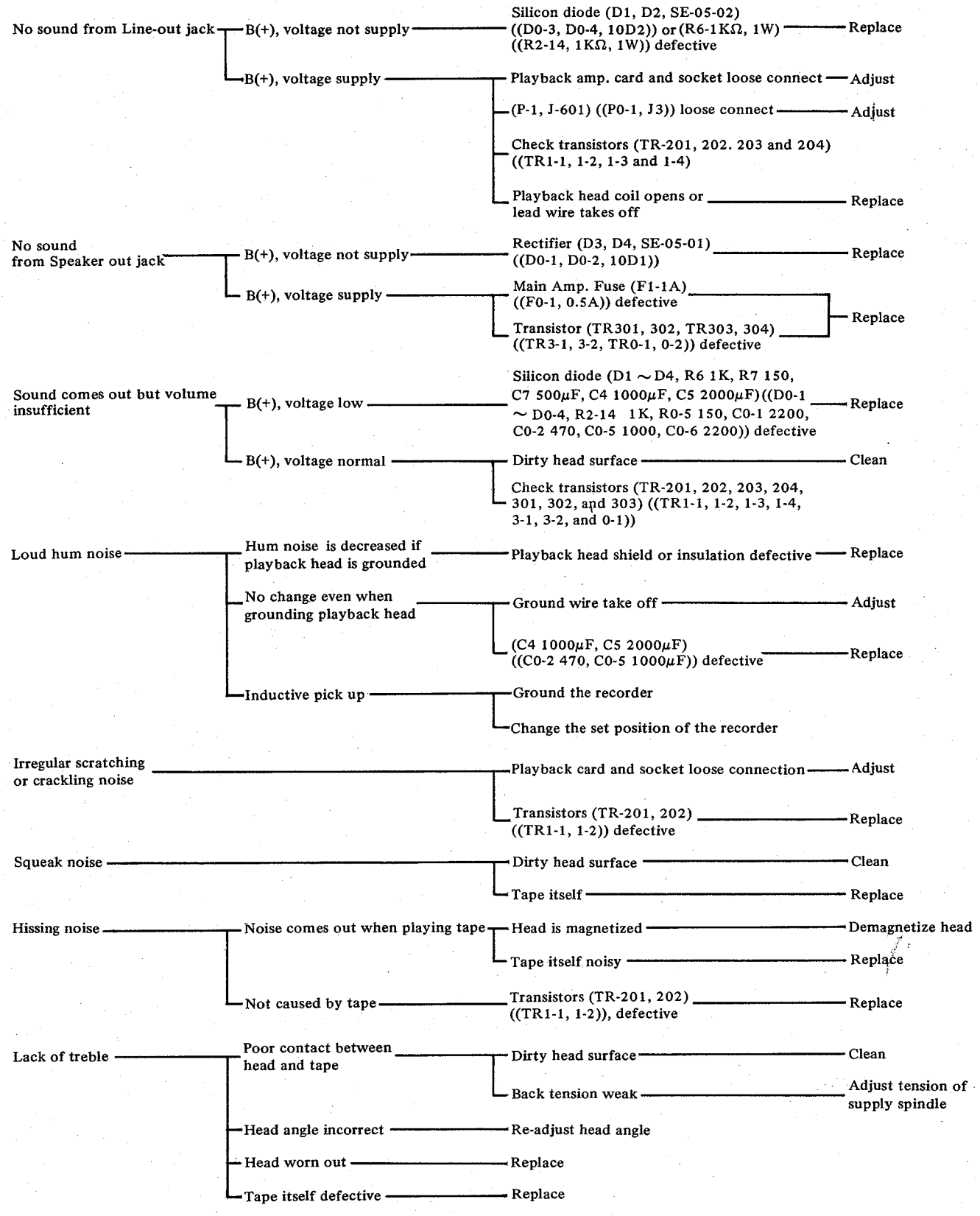


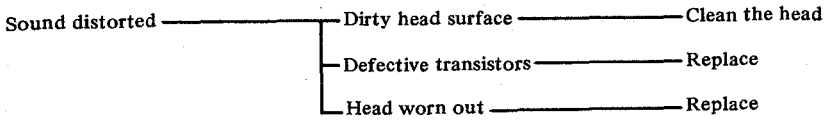
X. TROUBLE SHOOTING CHART

SECTION "A" TROUBLES WITH AMPLIFIER

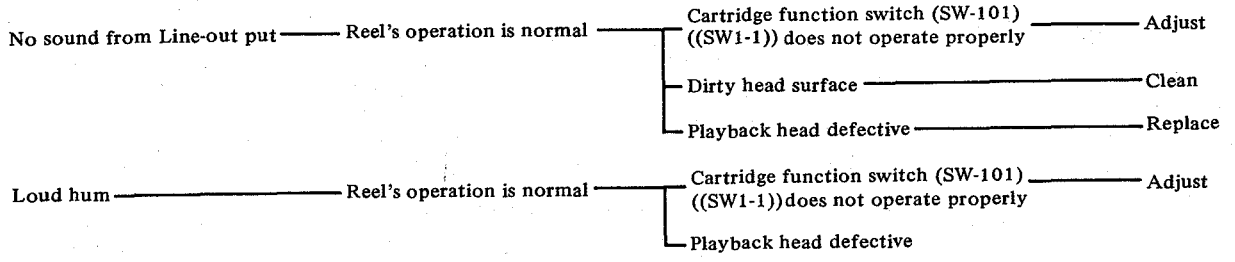
1. Playback problems. (Unit set in play position.)

a) Reel


No sound from Line-out jack
B(+), voltage not supply
Silicon diode (D1, D2, SE-05-02) ((D0-3, D0-4, 10D2)) or (R6-1KΩ, 1W) ((R2-14, 1KΩ, 1W)) defective
Replace
B(+), voltage supply
Playback amp. card and socket loose connect
Adjust
(P-1, J-601) ((P0-1, J3)) loose connect
Adjust
Check transistors (TR-201, 202. 203 and 204) ((TR1-1, 1-2, 1-3 and 1-4)
Playback head coil opens or lead wire takes off
Replace
No sound from Speaker out jack
B(+), voltage not supply
Rectifier (D3, D4, SE-05-01) ((D0-1, D0-2, 10D1))
Replace
B(+), voltage supply
Main Amp. Fuse (F1-1A) ((F0-1, 0.5A)) defective
Transistor (TR301, 302, TR303, 304) ((TR3-1, 3-2, TR0-1, 0-2)) defective
Replace
Sound comes out but volume insufficient
B(+), voltage low
Silicon diode (D1 ~ D4, R6 1K, R7 150, C7 500μF, C4 1000μF, C5 2000μF)((D0-1 ~ D0-4, R2-14 1K, R0-5 150, C0-1 2200, C0-2 470, C0-5 1000, C0-6 2200)) defective
Replace
B(+), voltage normal
Dirty head surface
Clean
Check transistors (TR-201, 202, 203, 204, 301, 302, and 303) ((TR1-1, 1-2, 1-3, 1-4, 3-1, 3-2, and 0-1))
Loud hum noise
Hum noise is decreased if playback head is grounded
Playback head shield or insulation defective
Replace
No change even when grounding playback head
Ground wire take off
Adjust
(C4 1000μF, C5 2000μF) ((C0-2 470, C0-5 1000μF)) defective
Replace
Inductive pick up
Ground the recorder
Change the set position of the recorder
Irregular scratching or crackling noise
Playback card and socket loose connection
Adjust
Transistors (TR-201, 202) ((TR1-1, 1-2)) defective
Replace
Squeak noise
Dirty head surface
Clean
Tape itself
Replace
Hissing noise
Noise comes out when playing tape
Head is magnetized
Demagnetize head
Tape itself noisy
Replace
Not caused by tape
Transistors (TR-201, 202) ((TR1-1, 1-2)), defective
Replace
Lack of treble
Poor contact between head and tape
Dirty head surface
Clean
Back tension weak
Adjust tension of supply spindle
Head angle incorrect
Re-adjust head angle
Head worn out
Replace
Tape itself defective
Replace

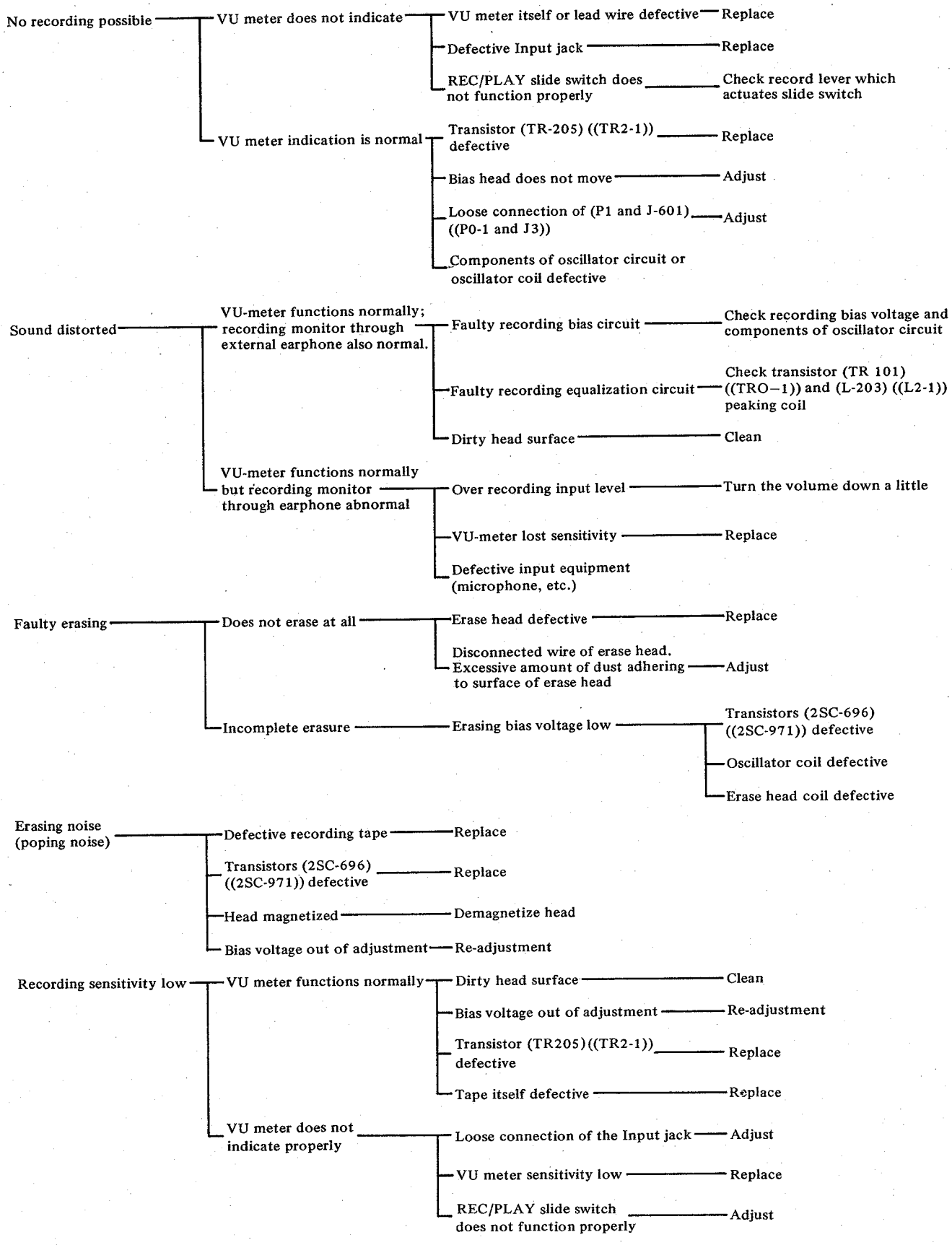

Sound distorted
Dirty head surface
Clean the head
Defective transistors
Replace
Head worn out
Replace

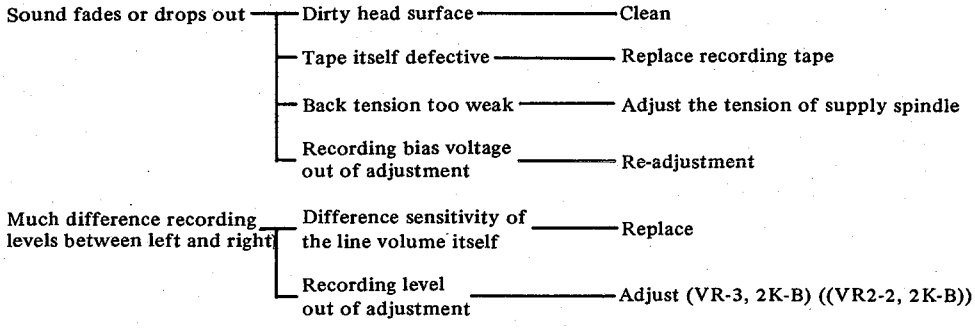
b) Cartridge


No sound from Line-out put
Reel's operation is normal
Cartridge function switch (SW-101) ((SW1-1)) does not operate properly
Adjust
Dirty head surface
Clean
Playback head defective
Replace
Loud hum
Reel's operation is normal
Cartridge function switch (SW-101) ((SW1-1)) does not operate properly
Adjust
Playback head defective

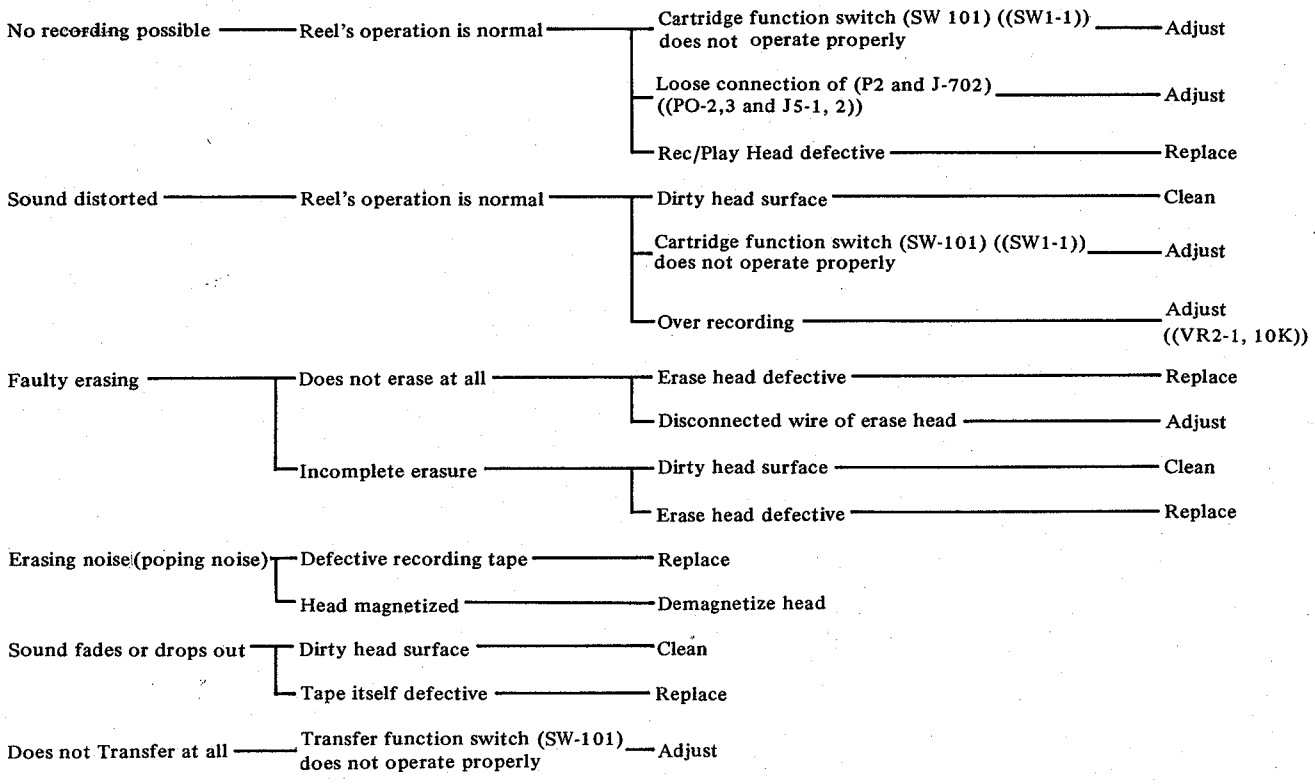
2. Recording problems. (Unit plays back pre-recorded tapes okay, but recording not satisfactory.)

a) Reel

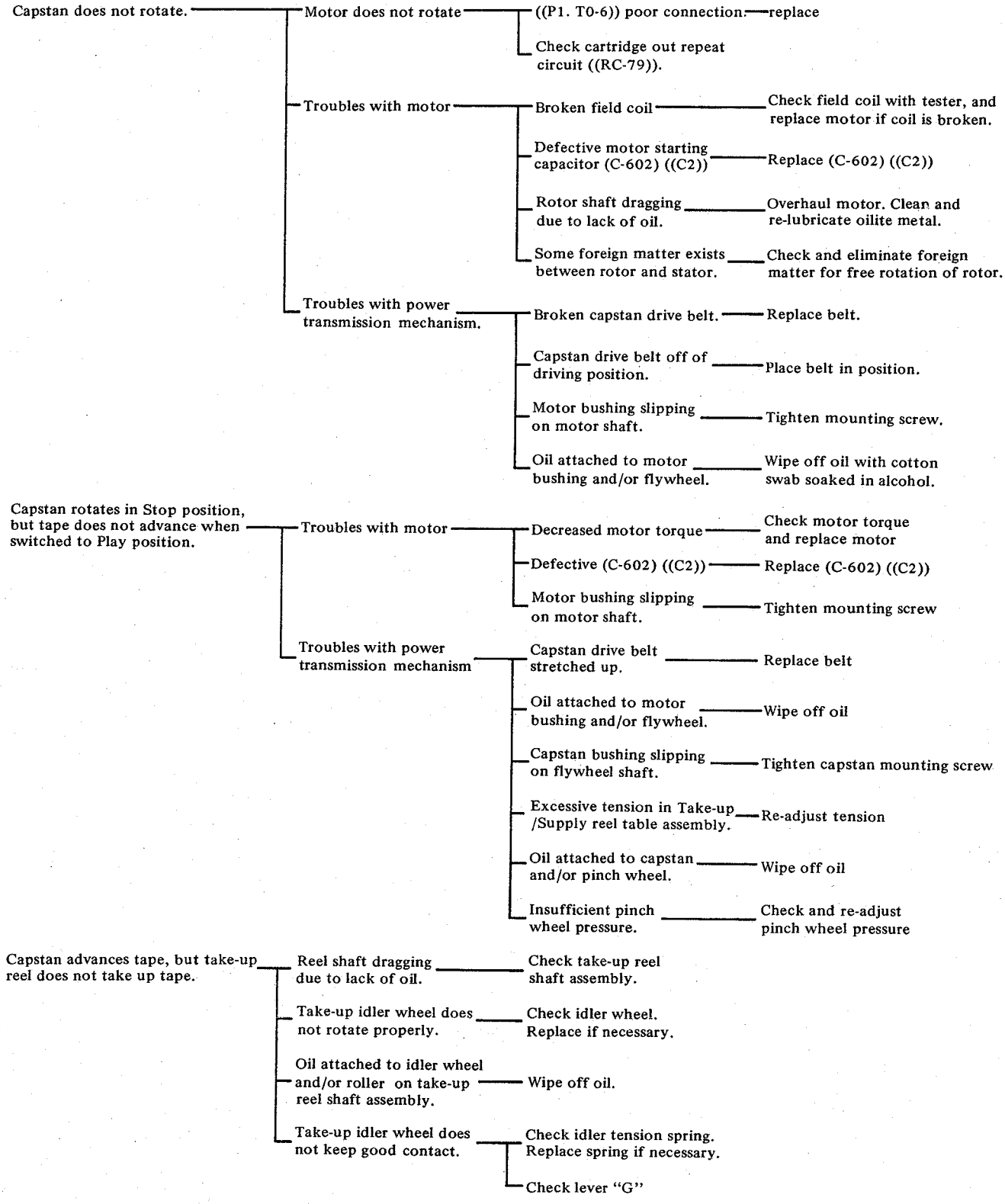


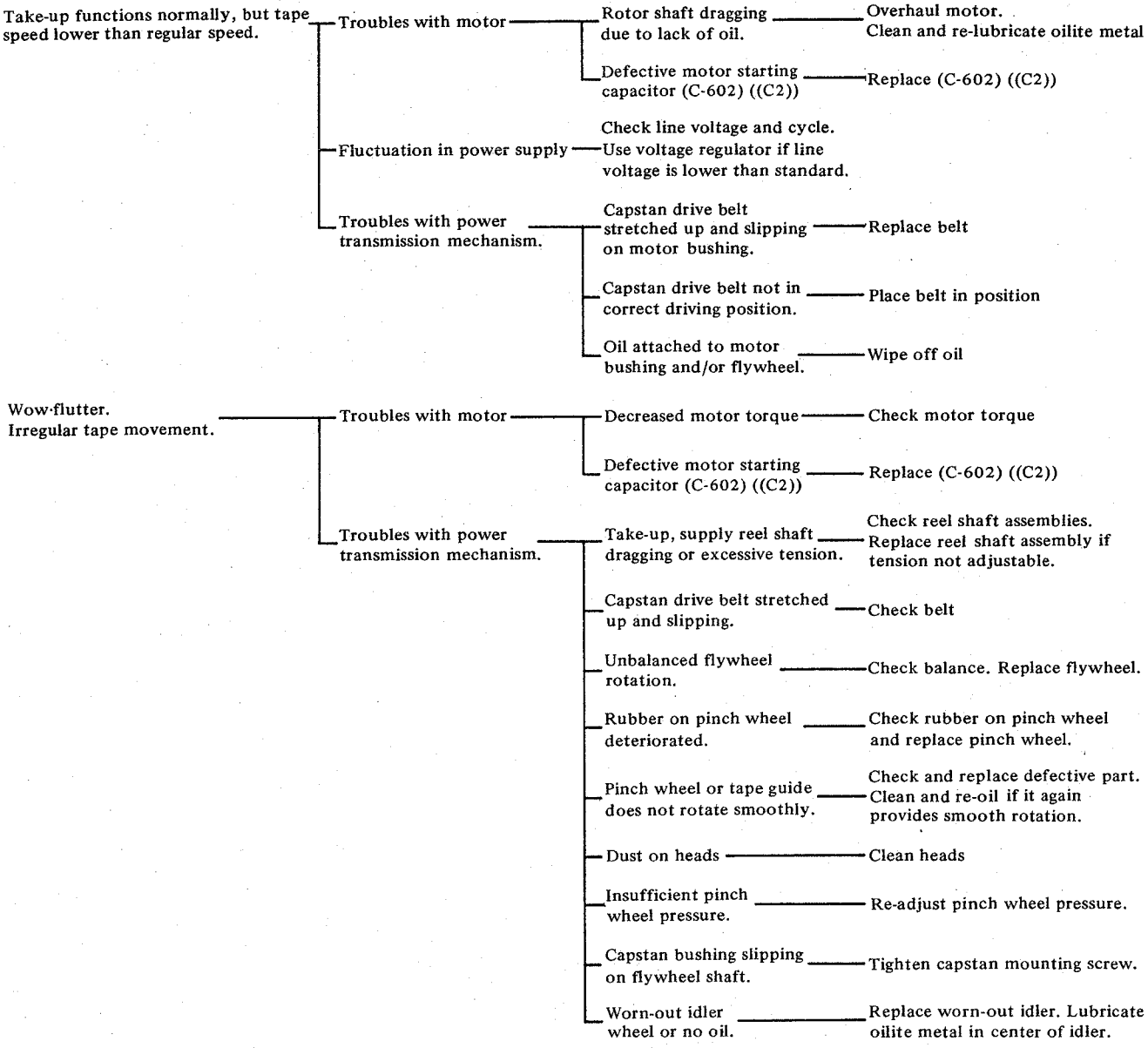

Sound fades or drops out
Dirty head surface
Clean
Tape itself defective
Replace recording tape
Back tension too weak
Adjust the tension of supply spindle
Recording bias voltage out of adjustment
Re-adjustment
Much difference recording levels between left and right
Difference sensitivity of the line volume itself
Replace
Recording level out of adjustment
Adjust (VR-3, 2K-B) ((VR2-2, 2K-B))

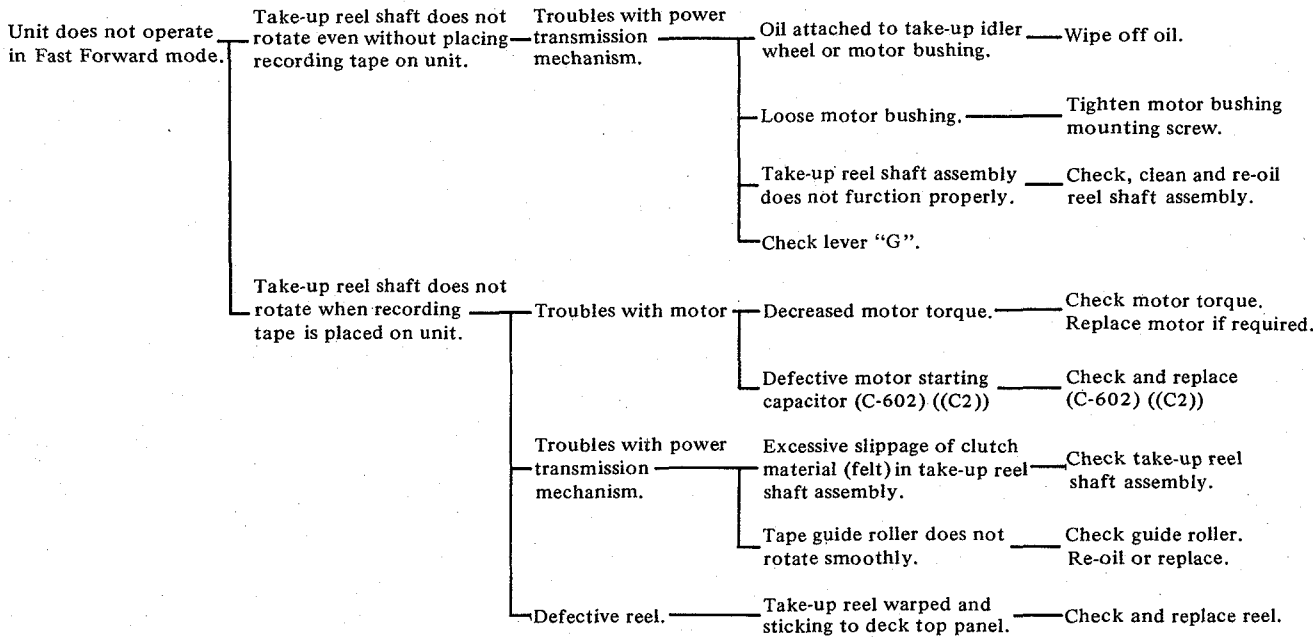
b) Cartridge

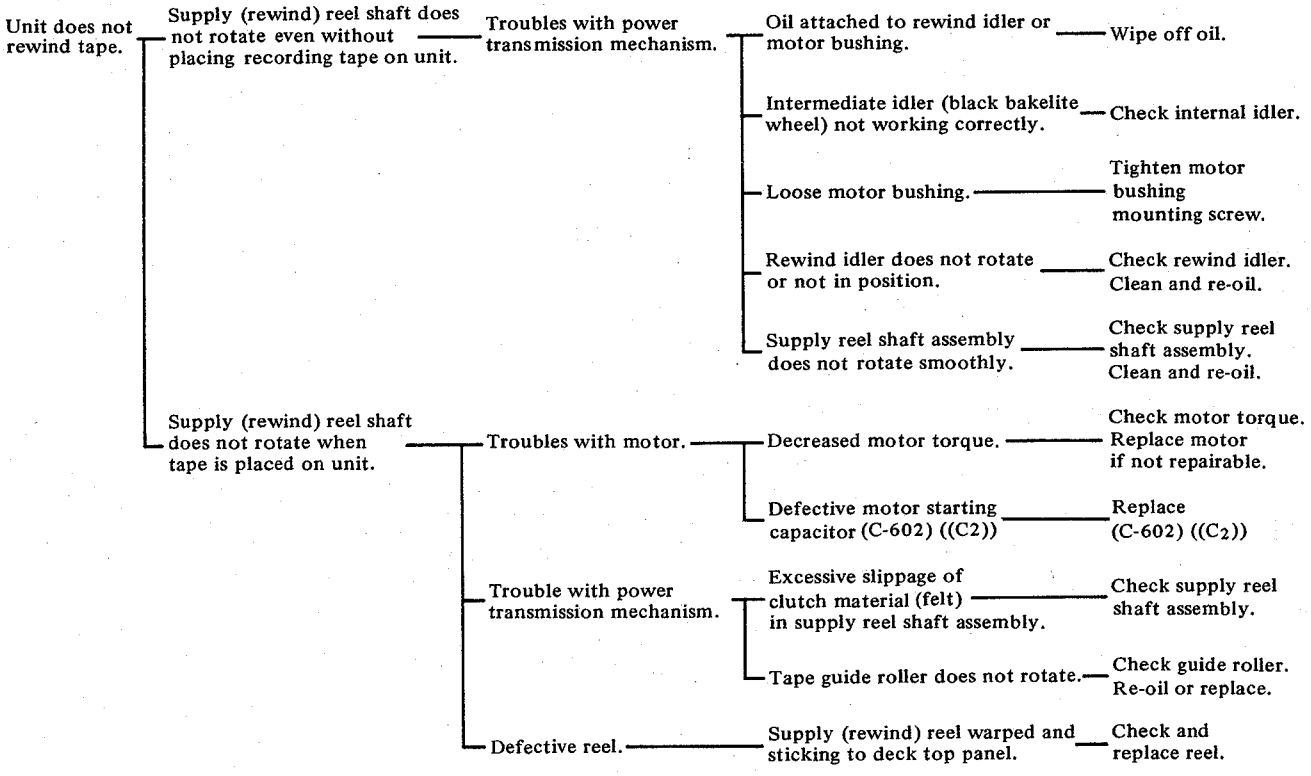

No recording possible
Reel's operation is normal
Cartridge function switch (SW 101) ((SW1-1)) does not operate properly
Adjust
Loose connection of (P2 and J-702) ((PO-2,3 and J5-1, 2))
Adjust
Rec/Play Head defective
Replace
Sound distorted
Reel's operation is normal
Dirty head surface
Clean
Cartridge function switch (SW-101) ((SW1-1)) does not operate properly
Adjust
Over recording
Adjust ((VR2-1, 10K))
Faulty erasing
Does not erase at all
Erase head defective
Replace
Disconnected wire of erase head
Adjust
Incomplete erasure
Dirty head surface
Clean
Erase head defective
Replace
Erasing noise(poping noise)
Defective recording tape
Replace
Head magnetized
Demagnetize head
Sound fades or drops out
Dirty head surface
Clean
Tape itself defective
Replace
Does not Transfer at all
Transfer function switch (SW-101) does not operate properly
Adjust

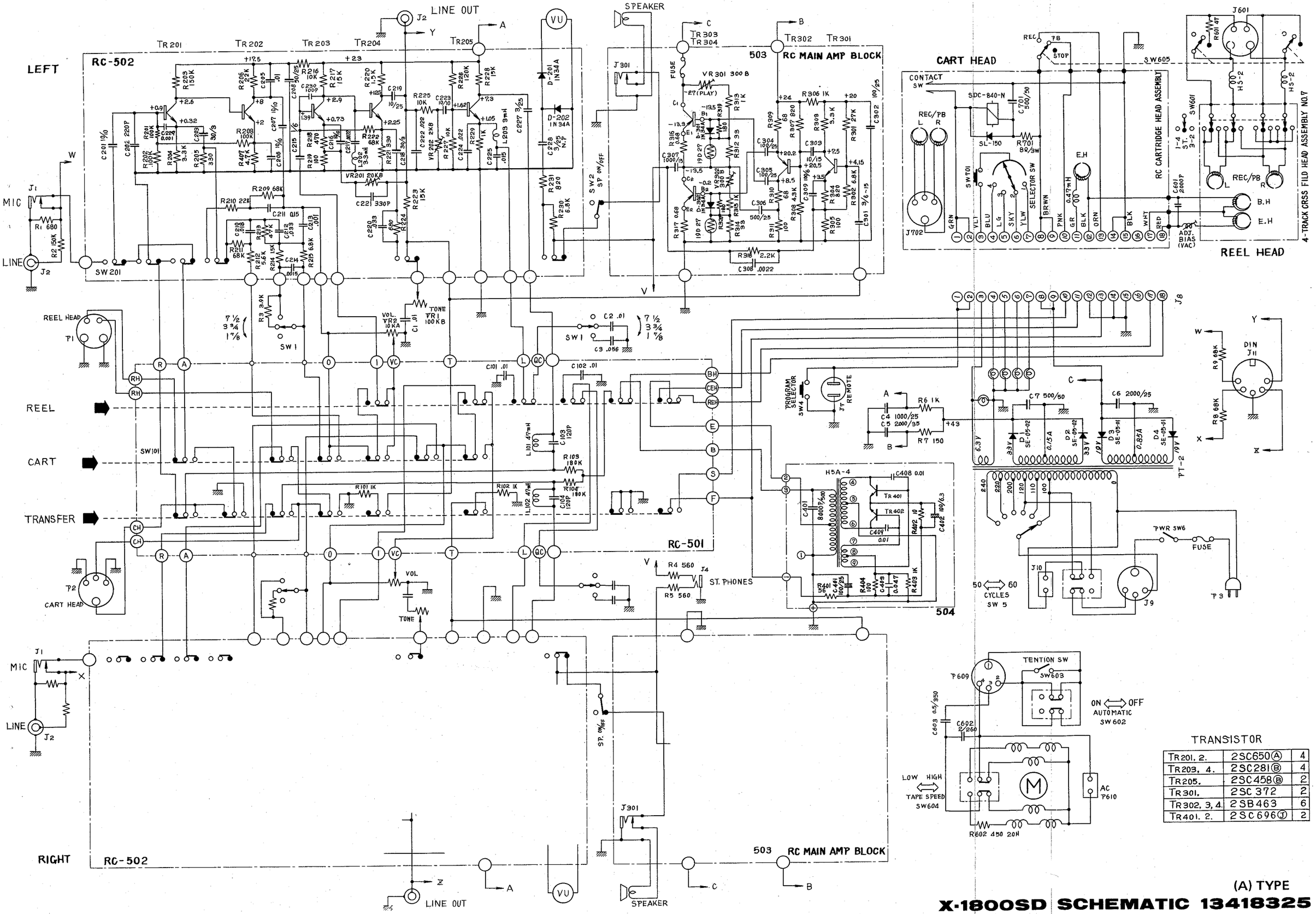
SECTION "B" TROUBLES WITH TAPE TRANSPORT MECHANISM


Capstan does not rotate.
Motor does not rotate
((P1. T0-6)) poor connection
replace
Check cartridge out repeat circuit ((RC-79)).
Troubles with motor
Broken field coil
Check field coil with tester, and replace motor if coil is broken.
Defective motor starting capacitor (C-602) ((C2))
Replace (C-602) ((C2))
Rotor shaft dragging due to lack of oil.
Overhaul motor. Clean and re-lubricate oilite metal.
Some foreign matter exists between rotor and stator.
Check and eliminate foreign matter for free rotation of rotor.
Troubles with power transmission mechanism.
Broken capstan drive belt.
Replace belt.
Capstan drive belt off of driving position.
Place belt in position.
Motor bushing slipping on motor shaft.
Tighten mounting screw.
Oil attached to motor bushing and/or flywheel.
Wipe off oil with cotton swab soaked in alcohol.
Capstan rotates in Stop position, but tape does not advance when switched to Play position.
Troubles with motor
Decreased motor torque
Check motor torque and replace motor
Defective (C-602) ((C2))
Replace (C-602) ((C2))
Motor bushing slipping on motor shaft.
Tighten mounting screw
Troubles with power transmission mechanism
Capstan drive belt stretched up.
Replace belt
Oil attached to motor bushing and/or flywheel.
Wipe off oil
Capstan bushing slipping on flywheel shaft.
Tighten capstan mounting screw
Excessive tension in Take-up /Supply reel table assembly.
Re-adjust tension
Oil attached to capstan and/or pinch wheel.
Wipe off oil
Insufficient pinch wheel pressure.
Check and re-adjust pinch wheel pressure
Capstan advances tape, but take-up reel does not take up tape.
Reel shaft dragging due to lack of oil.
Check take-up reel shaft assembly.
Take-up idler wheel does not rotate properly.
Check idler wheel. Replace if necessary.
Oil attached to idler wheel and/or roller on take-up reel shaft assembly.
Wipe off oil.
Take-up idler wheel does not keep good contact.
Check idler tension spring. Replace spring if necessary.
Check lever "G"


Take-up functions normally, but tape speed lower than regular speed.
Troubles with motor
Rotor shaft dragging due to lack of oil.
Overhaul motor. Clean and re-lubricate oilite metal
Defective motor starting capacitor (C-602) ((C2))
Replace (C-602) ((C2))
Fluctuation in power supply
Check line voltage and cycle. Use voltage regulator if line voltage is lower than standard.
Troubles with power transmission mechanism.
Capstan drive belt stretched up and slipping on motor bushing.
Replace belt
Capstan drive belt not in correct driving position.
Place belt in position
Oil attached to motor bushing and/or flywheel.
Wipe off oil
Wow-flutter. Irregular tape movement.
Troubles with motor
Decreased motor torque
Check motor torque
Defective motor starting capacitor (C-602) ((C2))
Replace (C-602) ((C2))
Troubles with power transmission mechanism.
Take-up, supply reel shaft dragging or excessive tension.
Check reel shaft assemblies. Replace reel shaft assembly if tension not adjustable.
Capstan drive belt stretched up and slipping.
Check belt
Unbalanced flywheel rotation.
Check balance. Replace flywheel.
Rubber on pinch wheel deteriorated.
Check rubber on pinch wheel and replace pinch wheel.
Pinch wheel or tape guide does not rotate smoothly.
Check and replace defective part. Clean and re-oil if it again provides smooth rotation.
Dust on heads
Clean heads
Insufficient pinch wheel pressure.
Re-adjust pinch wheel pressure.
Capstan bushing slipping on flywheel shaft.
Tighten capstan mounting screw.
Worn-out idler wheel or no oil.
Replace worn-out idler. Lubricate oilite metal in center of idler.


Unit does not operate in Fast Forward mode.
Take-up reel shaft does not rotate even without placing recording tape on unit.
Troubles with power transmission mechanism.
Oil attached to take-up idler wheel or motor bushing.
Wipe off oil.
Loose motor bushing.
Tighten motor bushing mounting screw.
Take-up reel shaft assembly does not furction properly.
Check, clean and re-oil reel shaft assembly.
Check lever "G".
Take-up reel shaft does not rotate when recording tape is placed on unit.
Troubles with motor
Decreased motor torque.
Check motor torque. Replace motor if required.
Defective motor starting capacitor (C-602) ((C2))
Check and replace (C-602) ((C2))
Troubles with power transmission mechanism.
Excessive slippage of clutch material (felt) in take-up reel shaft assembly.
Check take-up reel shaft assembly.
Tape guide roller does not rotate smoothly.
Check guide roller. Re-oil or replace.
Defective reel.
Take-up reel warped and sticking to deck top panel.
Check and replace reel.


Unit does not rewind tape.
Supply (rewind) reel shaft does not rotate even without placing recording tape on unit.
Troubles with power transmission mechanism.
Oil attached to rewind idler or motor bushing.
Wipe off oil.
Intermediate idler (black bakelite wheel) not working correctly.
Check internal idler.
Loose motor bushing.
Tighten motor bushing mounting screw.
Rewind idler does not rotate or not in position.
Check rewind idler. Clean and re-oil.
Supply reel shaft assembly does not rotate smoothly.
Check supply reel shaft assembly. Clean and re-oil.
Supply (rewind) reel shaft does not rotate when tape is placed on unit.
Troubles with motor.
Decreased motor torque.
Check motor torque. Replace motor if not repairable.
Defective motor starting capacitor (C-602) ((C2))
Replace (C-602) ((C2))
Trouble with power transmission mechanism.
Excessive slippage of clutch material (felt) in supply reel shaft assembly.
Check supply reel shaft assembly.
Tape guide roller does not rotate.
Check guide roller. Re-oil or replace.
Defective reel.
Supply (rewind) reel warped and sticking to deck top panel.
Check and replace reel.
Loose tape winding after being placed in Rewind or Fast-Forward mode.
Decreased back tension of take-up and supply reel shaft assemblies.
Disassemble reel shaft assemblies and strengthen back tension.
Tape spills when stopped from Rewind or Fast-Forward mode.
Excessive slippage of felt clutch material in take-up and rewind reel shaft assemblies.
Re-adjust slippage of felt clutch material. Replace defective reel shaft assembly if this re-adjustment is difficult.
Reels of different size are used. For example, 5" reel on take-up side and 7" reel on supply side.
Always use reels of same size on both sides.
Brake does not function properly.
Worn-out brake shoes.
Check and replace brake shoes.
Oil attached to surface of brake shoes.
Wipe off oil with cotton swab soaked in alcohol.
Loose brake shoes.
Tighten brake shoes mounting screw.
Brake lever does not function properly.
Check and re-adjust brake lever.
Periodical clack noise when rewinding or fast forwarding tape.
Worn-out and rugged idler wheel.
Check idler wheel.
Loud motor vibration.
Loose motor mounting screw.
Tighten mounting screw.
Defective motor starting capacitor (C-602) ((C2))
Replace (C-602) ((C2))
Loose oil cover mounting screw.
Tighten mounting screw.
Squeaking noise when playing tape.
Deposit of dust on heads.
Clean heads.
Recording tape is being charged with static electricity.
Replace recording tape.
Excessive heat on head surface after continued operation.
Check tape head.
Old and worn-out recording tape.
Inspect recording tape.
Inferior recording tape.
Use recording tape of good quality.



(A) TYPE

X-1800SD SCHEMATIC 13418325

RC-550

TRI-1 2SC650(A) TRI-2 2SC650(A) TRI-3 2SC281(B) TRI-4 2SC281(B)

RC-553

TR2-1 2S458(B)

RC-551

TR3-1 2SB463(Y) TR3-2 2SC454(B)

RC-554

TR0-1 2SB463 TR0-2 2SB463

RC-79

4 TRACK CROSS FIELD HEAD ASSEMBLY NO.11

RC-551

TR401 TR402 2SC971(3)

SW0-5 EQUALIZATION
- ● 7 1/2"
- ○ 3 3/4"
- ○ 1 7/8"

P&J CONNECTION	
AMP ↔	MECHA
JO-6	P1
JO-5	P2
PO-1	J3
JO-7	PO-5
PO-2	J5-1
PO-3	J5-2
JO-15	RC79

✦NOTO. LINKING SW5(MECHA) WITH SW2-1a.b & SW4-1(AMP)✦

(B) TYPE

FOR THE ONE AFTER SERIAL NUMBER 66478

X-1800SD SCHEMATIC DIAGRAM 13624523

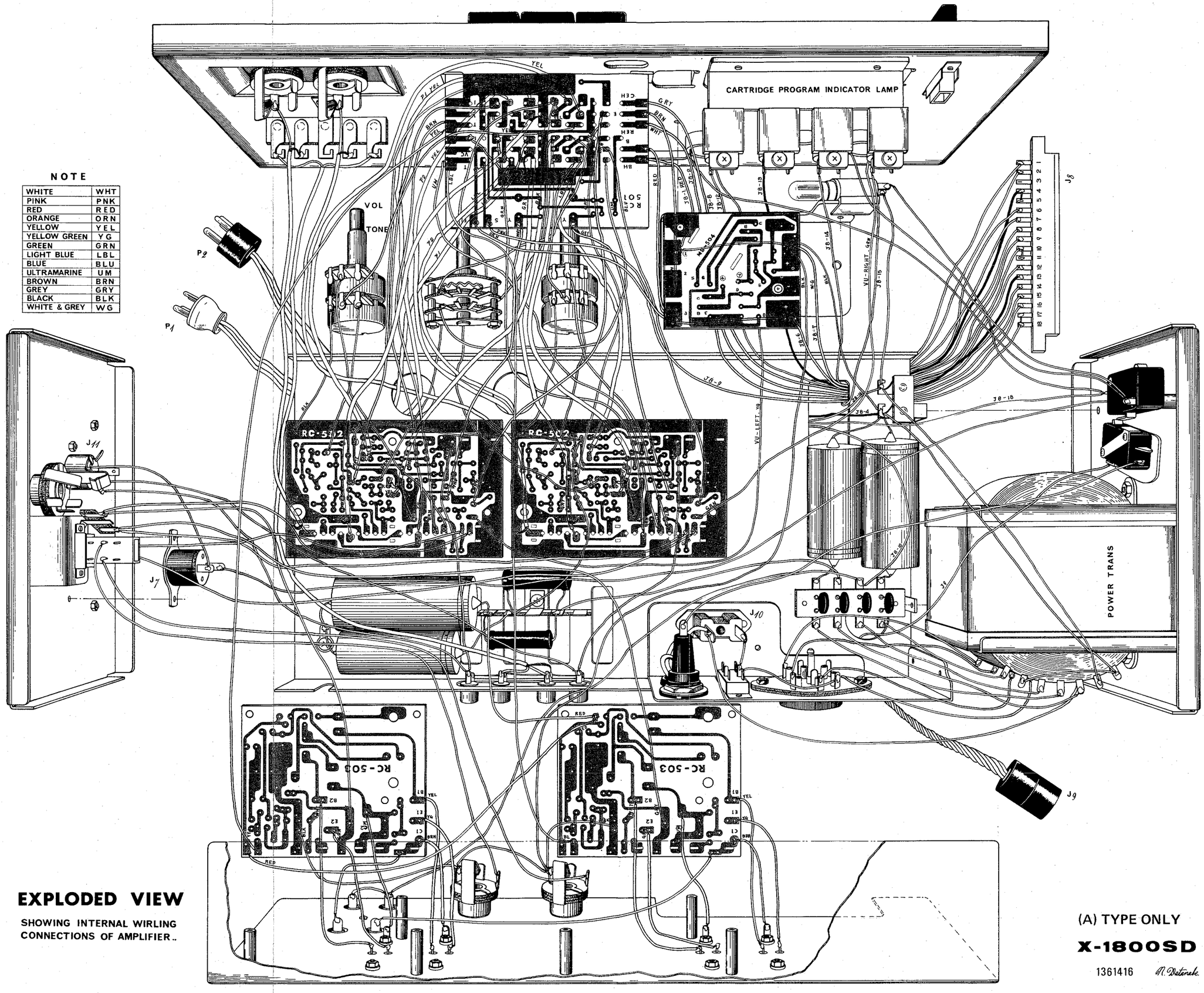
H.W.

- Automatic stopping device does not function.
  - Automatic stop lever moves normally.
    - Broken plate-shaped spring — Check spring.
    - Broken eccentric gear. (Black bakelite gear) — Check eccentric gear.
    - Nail on eccentric gear broken off. — Check nail on eccentric gear.
    - Holding plate for eccentric gear defective.
      - Check if eccentric gear sticking to holding plate.
      - Check guide groove on deck sub-plate and mounting screws.
    - Defective instant stop lever.
      - Check instant stop mechanism.
      - Check mounting screw.
    - Bent REC-PLAY switch re-setting lever. — Check lever.
  - Automatic stop lever does not move or sticky.
    - Broken lever spring or lever spring not in position. — Check lever spring.
    - Automatic stop lever sticks to rear deck panel. — Check rear side of deck sub-plate.
    - No lubricant on lever shaft, or dust on shaft. — Clean and re-lubricate lever shaft.
- Cycle change switch does not move.
  - No lubricant on cycle conversion lever. — Relubricate lever.
  - Eccentric or bent cycle conversion lever. — Check cycle conversion lever.
  - Capstan drive belt not on driving track of flywheel. — Check capstan drive belt.
  - Loose motor bushing. — Tighten mounting screw.
  - Loose motor mount screw. — Tighten mounting screw.
  - Oil on motor bushing or on flywheel. — Wipe off oil with cotton swab soaked in alcohol.
- Cartridge Auto-stop does not operate
  - B(+), supply to the Relay — Relay ((RL5-1)) defective — Replace
  - B(+), voltage not supply — defective — Replace
- Cartridge Program Selector does not operate
  - Pushing the Program Selector Button
    - Relay (SDC-840-N) ((RL5-1)) defective — Replace
    - Program Changing Switch (SW-4) ((SW0-4)) defective — Replace
    - (R-701, 8Ω 3W) ((R5-1, 8Ω 3W)) defective — Replace
  - Using the Sensing tape (foil tape) only
    - Sensing tape itself defective — Replace
    - Loosing contact pine — Adjust

MEMO

NOTE

WHITE	WHT
PINK	PNK
RED	RED
ORANGE	ORN
YELLOW	YEL
YELLOW GREEN	YG
GREEN	GRN
LIGHT BLUE	LBL
BLUE	BLU
ULTRAMARINE	UM
BROWN	BRN
GREY	GRY
BLACK	BLK
WHITE & GREY	WG



EXPLODED VIEW

SHOWING INTERNAL WIRLING CONNECTIONS OF AMPLIFIER..

(A) TYPE ONLY

X-1800SD

1361416 *M. Watanabe*

RC-550

TR1-1 2SC650(A) TR1-2 2SC650(A) TR1-3 2SC281(B) TR1-4 2SC281(B)

RC-553

TR2-1 2S458(B)

RC-589

RC-554

RC-79

RC-589

RC OSC BLOCK

DIN JO-2

MIC. JO-3

LINE JO-3

REEL PO-1

REEL SW2-2

CART. PO-2

TRANSFER PO-3

MIC. JO-8

LINE JO-9

SW2-1a REC. P.B.

SW2-1b

TAPE SPEED SW 3 LOW HIGH

24L MOTOR

TENSION SW SW-1

AUTOMATIC SW 2

CART. HEAD E.H E8-1 REC/PB P8-1

REC/P.B HEAD P4-100

ERASE HEAD E4-5

BIAS HEAD B4-5

4 TRACK CROSS FIELD HEAD ASSEMBLY NO.11

SW5 EQUALIZATION ● 7 1/2" ○ 3 3/4" ○ 1 7/8"

SW6 CONT PLAY

SW4 AUTO STOP

SW0-1 240V 220 200 120 110 100

SW0-2 50 60

SW0-3 POWER

SW0-4 SELECTOR

SW0-5 REMOTE

SW0-6 ON-OFF

TO-1

JO-15

P&J CONNECTION

AMP.	MECHA
JO-6	P1
JO-5	P2
PO-1	J3
JO-7	PO-5
PO-2	J5-1
PO-3	J5-2
JO-15	RC79

TR401 TR402 2SC971(3)

◆NOTO. LINKING SW5(MECHA) WITH SW2-1a.b & SW4-1(AMP)◆

FOR THE ONE AFTER SERIAL NUMBER 66478

(C) TYPE

X-1800SD SCHEMATIC DIAGRAM 13624524